

# Jobs in Demand

## MANUFACTURING CAREERS



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### Inside:

- 3 Myth busters
- 8 Career paths
- 16 Enter to win prizes

# Contents

- 3** Myth busters
- 4-5** Manufacturing: past and present
- 6** Industrial "athlete"
- 7** Find your future
- 8-9** Blaze your own path
- 10** Payday
- 11** High school programs
- 12** Manufacturing our future
- 13** Harley-Davidson and Federal Tool
- 14** Fun facts
- 15** Resource guide
- 16** Win prizes



**JIM DOYLE**  
GOVERNOR  
STATE OF WISCONSIN



photo courtesy of the Office of the Governor

May 22, 2008

Greetings!

As governor, I am pleased that you are interested in joining Wisconsin's strong manufacturing work force. Manufacturing is a bedrock industry in this state, and businesses across the state are looking for smart, motivated, young people to lead the future of Wisconsin industry.

Wisconsin manufacturers are second to none. From Harley-Davidson to SC Johnson to Kimberly-Clark and Miller Brewing Company, Wisconsin is known around the world for its top-quality, reliable manufacturers.

Wisconsin manufacturing defines our heritage, and it will determine our future as well. In the next six years, 70,000 manufacturing jobs will need to be filled as workers retire and positions open. These jobs are high skilled and high paying. The average pay for a manufacturing job in Wisconsin is almost \$46,000 – well above average earnings in the state.

The next generation of manufacturing will require innovative and efficient technologies to meet the demands of a competitive global market. My administration will continue to provide resources for manufacturers to invest in the computers, robots and other advanced technologies that will make our factories more productive and competitive.

We also will invest in the talented, young work force that will lead the way in manufacturing. Working in this sector requires problem solvers, creative thinkers and innovators. Knowledge, curiosity and skills are in demand and so are workers for the many high-growth, high-paying jobs that you will learn about in this publication.

I hope you will take this chance to learn more about the opportunities available to you in Wisconsin manufacturing. From technical college programs and apprenticeships to university education, training grants and mentoring programs, there are many resources available to you.

Together, we will build a prosperous future for Wisconsin.

Sincerely,

Jim Doyle  
Governor

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# Myth busters

Manufacturing suffers from a misinformation problem. The facts show that opportunities in manufacturing are brighter than what many perceive. Which myths have you believed?

**Myth:** Manufacturing is no longer important to Wisconsin's economy.

**Fact:** Manufacturing remains the leading contributor to Wisconsin's gross domestic product and the leading employer. Wisconsin ranks second behind Indiana with 498,000 jobs or 18% of all jobs in manufacturing. According to Wisconsin's Department of Commerce, Wisconsin is the only top 10 manufacturing state to add manufacturing jobs. Wisconsin's exports are up 50%, nearly double the national average.

**Myth:** Manufacturing is declining and being replaced by a technology-driven economy.

**Fact:** Manufacturing is the engine of technology development and innovation, responsible for more than 70% of private sector research and development.

**Myth:** Manufacturing jobs are generally low-paying, unskilled positions.

**Fact:** Manufacturing in the 21st century is highly efficient and productive, requiring an educated, motivated and creative work force. Manufacturing wages and benefits are approximately 25% higher than non-manufacturing jobs.

**Myth:** Only people who don't go to college go into manufacturing.

**Fact:** Fields such as quality control, supply chain management and biotechnology require specialized degrees, and all these jobs happen at factories.

**Myth:** Most factories are huge assembly plants with plenty of machinery and workers.

**Fact:** Most manufacturers in Wisconsin are very small, with fewer than 10 workers. Fewer than 5% of Wisconsin manufacturers employ more than 250 people.

**Myth:** Most manufacturing employees receive low wages.

**Fact:** Recent reports indicate that the average manufacturing wage is \$54,000 a year. That's 18% higher than the average U.S. salary.

**Myth:** Manufacturing workers haven't completed high school.

**Fact:** Roughly 78% of those in manufacturing jobs have attained at least a high school education.

**Myth:** You need limited education to be a manufacturing worker. And this type of education draws students who don't excel in other areas.

**Fact:** The National Association of Manufacturers found that today's manufacturers look for a scope of skills that extends beyond hands-on abilities to math, science and computer proficiency.

**Myth:** Employees in manufacturing – like workers in many other industries – must now shoulder most benefit costs.

**Fact:** More than 80% of manufacturers still take care of most medical benefits, including dental.

**Myth:** The loss of manufacturing employment can be solely attributed to U.S. manufacturers transplanting jobs to overseas locations.

**Fact:** While the overseas migration of jobs is perhaps the main reason for the loss of U.S. manufacturing work, other factors also come into play, according to recent studies sponsored by NAM. They include the struggling U.S. economy, what NAM views as extremely aggressive global tactics, and even a shortage of qualified prospects – many manufacturers report that they have a hard time finding capable workers to fill positions.

**Myth:** Manufacturing work entails manual labor and can put employees at risk for injury.

**Fact:** While some types of factory work will always involve physical labor, automation and ergonomic consciousness have decreased the need for manual labor and reduced workplace injuries.

**Myth:** Manufacturing jobs are dark, depressing occupations.

**Fact:** Manufacturing today is cleaner, more interesting and technology-driven. According to NAM, the three largest industries in the United States are chemicals, industrial machinery and equipment. Fifty years ago, top industries were food, primary metals and motor vehicles.

**Myth:** Manufacturing is declining and losing productivity.

**Fact:** Over the past two decades, manufacturing productivity gains have been double that of other economic sectors.

Sources: Wisconsin Department of Commerce, 2007; "Facts on Manufacturing, 7th Edition," Deloitte & Touche, National Association of Manufacturing, 2006; "Who Works in Your Plant? A Profile of Today's American Factory Worker," by Nancy Syverson, managing editor, Industrial Maintenance & Plant Operations, November 2004.



## Kimberly Kamps

Graduate of MATC Adult High School  
Has associate degree in liberal arts  
Currently attending MATC

"I wanted the advantages of this untraditional occupation. I had no background in manufacturing and wasn't sure if I would like it or be good at it, but it turns out I am good at it, and I really like it."

photo by John Krejci

# Manufacturing

## Past to the present

by Dale Dulberger, Milwaukee Area Technical College–Wisconsin MSSC Project Director

Milwaukee was once a manufacturing center in the United States. In 1910, 57% of Milwaukee's male labor force was employed in manufacturing, and up until the 1960s, 40% of the city's labor force remained employed in manufacturing.

Large, industrial companies based in the area — Allis Chalmers, American Motors, A. O. Smith, Harnischfeger, Heil Corporation, Cutler-Hammer, Louis Allis, Nordberg, Allen Bradley and Schlitz — were leaders of the modern industrial revolution in this country.

In a Forbes magazine story in the 1950s, Milwaukee was called the "machine-tool capital of the world." If you had strong mechanical skills, you could find a manufacturing job that you could turn into a career, even without a college degree.

### New image

For decades, the many manufacturing jobs that dominated the Wisconsin economy helped our state prosper, but the image and the perception were not always inviting. The impressions of manufacturing were of backbreaking work on tedious, monotonous assembly lines; jobs that were repetitive, hazardous and in a dirty work environment.

Our image of manufacturing has changed dramatically.

Today, while manufacturing does not dominate our economy as in years past, it still accounts for 21% of the jobs in the region.

While there continues to be a strong core of larger manufacturers (Harley-Davidson, GE Medical Systems, Bucyrus International, Miller Brewing, SC Johnson and others) most of the regional job growth is in the small- and medium-sized manufacturing companies.

According to the U.S. Department of Labor, more than 90% of all manufacturers have fewer than 100 employees, and over 50% have less than ten.

This new generation of manufacturing enterprises is more innovative, technology driven, globally focused and environmentally conscious.

Global competition and advanced technology have changed the face of manufacturing. According to the U.S. Department of Labor, "Today U.S. manufacturing is more dynamic than ever. Productivity is up due to the use of advanced technology and new, lean organizations. Manufacturing today creates essential products that people need and want. Whether it is clothing, cell phones, computers, motorcycles, hybrid autos, medical devices, airplanes, earth-moving equipment – virtually everything we use on a daily basis is manufactured."

Manufacturing work also has changed. In the past, production employees needed only narrow, specific skills to maintain a job. Today, the organization of work has evolved and production workers need broad, technical skills that help them understand the entire operation.

For example, at John Deere in Horicon, Wis., production employees are being trained to work up to ten production cells. Communication and team skills are needed to understand quality systems and lean-manufacturing concepts.



### Cordell Hayes

Graduate of James Madison High School, Milwaukee

Has over 20 years experience in manufacturing

Currently director of operations for Holy Redeemer, Milwaukee, and MATC student

"Pay and benefits are better in manufacturing than most other fields, and the more you learn, the more you can advance."

photo by John Krejci



Gov. Jim Doyle visited Super Steel's Tower Ave. facility in April 2007. Super Steel is a manufacturer of metal parts with locations in Milwaukee and Schenectady, N.Y.

photo courtesy of the Office of the Governor

More math and science skills are needed to operate sophisticated, computer numerical control machines. According to the National Association of Manufacturers' Manufacturing Institute, students need to take math and science courses starting in middle school to succeed in today's technologically driven, manufacturing fields.

"Manufacturing encourages creativity and analytical thinking. It is an area where ideas can be tested almost immediately, and where one person's inspiration may lead to a major

breakthrough. For these reasons, students who want a career that is meaningful, exciting and rewarding should consider advanced manufacturing," wrote Pat Toensmeier in his article about manufacturing careers for InDemand magazine.

For young people seeking an interesting career where technical, skilled jobs are in demand, manufacturing offers exciting opportunities. Today's manufacturers need the talents and abilities of new workers to create the products of the future.

## Making history

First shipyards open in Milwaukee in the 1830s.

By 1860, nearly 200 breweries operate in Wisconsin; more than 40 located in Milwaukee.

Milwaukee has strong lumber and flour milling industries in the 1860s.

In 1869, J.I. Case in Racine creates a steam engine for its threshers.

Milwaukee Iron Company in Bay View produces iron rails for railroads in the 1870s.

The Allis Company (eventually Allis-Chalmers) is Milwaukee's largest employer and is known worldwide for its heavy machinery in the late 1880s.

Paper companies in Wisconsin experience rapid growth between 1900 and 1930.

The Kissel Kar firm in Hartford produces trucks for the Army during World War I.

Manitowoc Shipbuilding Company receives Navy contract to build submarines in the 1940s.



photo by John Krajci

### Wayne Buroker

Industrial maintenance electrician at Harley-Davidson

Graduate of Beloit Memorial High School

Has associate degree from Blackhawk Technical College and bachelor's degree in electrical engineering from Milwaukee School of Engineering

"There are lots of very new technologies which Harley is embracing and training its people in, such as robotics, machine vision and networking."

## The top 12 most critical skills

Here's what manufacturers look for in their employees:

1. Work cooperatively/teams\*
2. Work productively
3. Listening skills\*
4. Demonstrate positive attitude
5. Maintain a safe and productive workplace\*
6. Communicate clearly\*
7. Demonstrate personal integrity
8. Follow directions
9. Ability to analyze and solve problems\*
10. Adaptability\*
11. Demonstrate needed math skills \*
12. Think critically

\* indicates a Manufacturing Skills Standards Council skill standard

(Source: Wisconsin Technical College Systems Advanced Manufacturing Solutions Initiative, 2004)

# Industrial 'athlete'

Manufacturers seek workers who are skilled, productive and innovative – they want the industrial “athlete” of the future to join their team.

These industrial athletes are highly motivated, easily trainable and adaptable to changing needs. “Manufacturers are looking for a new type of worker, one who can think critically, make decisions independently and work productively in teams,” said Dan Clancy, Wisconsin Technical College System president.

To help companies train such workers, the Manufacturing Skill Standards Council has produced a national system of training, assessment and certification focused on the core skills and knowledge needed by the nation’s production workers.

The MSSC system awards a certified production technician credential to individuals who pass the four production modules: safety, quality practices and measurement, manufacturing processes and production, and maintenance awareness. MSSC

skills are applicable to all sectors of manufacturing. The goal is to credential 40% of the nation’s production work force over the next 10 years to provide manufacturers a sufficient pool of skilled workers well into the future.

The MSSC certification helps ensure that job training for incumbent workers and new hires meets the needs of both workers and businesses. For example, certification reflects a worker’s achievements and can improve career opportunities and earnings. For employers, certification simplifies the screening of job applicants and accurately assesses workers’ skills and knowledge.

Milwaukee Area Technical College is one of 16 Wisconsin technical colleges that provides MSSC training and assessment. Call Dale Dulberger, 414-297-7296; [www.matc.edu/wisconsinmssc](http://www.matc.edu/wisconsinmssc); or visit Wisconsin technical colleges Web site, [www.witechcolleges.com](http://www.witechcolleges.com); or call Amy Phillips, Department of Workforce Development, 1-608-267-3214.



photo by John Krejci

## Mike Moberg

Graduate of Hartford Union High School  
Has two certificates for programming robotic welders  
Enrolled in MSSC training at MATC  
Shift supervisor at Vulcan Industries

“It’s a family-like environment here. The company is allowing me to get more training; I would like to move on to management in the future and MSSC training is providing the opportunity to accomplish my goals.”

## On the job

**Vulcan Industries, Germantown**

**Number of employees:** 50

**When founded:** 1945

**What they do:** Uses progressive die technology in tube forming, and metal stamping, as well as robotic welding equipment and assembly and packaging operations. Customers include Harley-Davidson, Cooper Power Systems and Gardner Denver Thomas Products.

Vulcan Industries currently has 12 employees attending the Manufacturing Skill Standard Certification through MATC, and 12 more employees will have the opportunity to attend the next session. Vulcan Industries pays for the class and pays the employees for time spent attending class.

“We have reliable, dedicated people here and we want to help them move forward,” said Bob Delgado, operations manager at Vulcan Industries. “MSSC provides the framework for employees to work in other areas and earn more.”

Delgado said the company has been expanding and employee training is crucial for Vulcan Industries’ success. “To provide our customers the best service and products, we make sure our employees are knowledgeable, skilled and well-trained,” he added.

Vulcan offers tours of the facility to high school students. “We want students and their parents to know about the opportunities here; the clean, safe environment and the competitive wages. We need to be able to find qualified job candidates as we expand in the future,” Delgado said.



# Advanced manufacturing-related occupations and projected 10-year growth in the United States

Source: Career Voyages – Advanced Manufacturing Occupations, Department of Labor Employment Training Administration

Occupational Title	Projected Need for Employees 2006-2016	Projected Growth	2006 Wage Range	Education and Training Needed
Maintenance and repair workers	174,000	9% - 17%	\$18,000 - \$48,000	High school, some college
Industrial engineers	89,000	18% - 26%	\$44,000 - \$98,000	Some college – college degree or higher
Industrial machinery mechanics	67,000	9% - 17%	\$26,000 - \$60,000	High school, some college
Mechanical engineers	58,000	0% - 8%	\$44,000 - \$100,000	College degree or higher
Environmental technicians	24,000	27% +	\$22,000 - \$58,000	Some college – college degree or higher
Industrial engineering technicians	22,000	9% - 17%	\$30,000 - \$76,000	High school, some college and/or college degree or higher
Technical writers	24,000	18% - 26%	\$34,000 - \$88,000	Some college – college degree or higher
Machine tool operators	20,000	0% - 8%	\$18,000 - \$48,000	High school, some college
Welding technicians	13,000	0% - 8%	\$20,000 - \$50,000	High school, some college

## Find your future

by Mona Schroeder-Beers, career coach,  
Milwaukee Area Technical College

Do you ever wonder how some people seem to land great jobs? Is it that they just get lucky? Would you like to know the secret to having a great job come your way?

Before I tell you that secret, I want to know if you're up to the challenge. Are you willing to take some risks and do things that may be outside your comfort zone? Are you willing to make sacrifices in the ways you invest your time? Are you willing to set goals and use self-discipline to reach those goals? If you can honestly answer yes to those questions, I will bet that you can not only land a great job, but have a great career.

So, what is this secret to making your career happen? It's called career planning.

### Planning pays off

I'm sure many people have asked you, "What do you want to be when you grow up?" Whether you know the answer to that question or not, the career planning process can help you advance toward a rewarding career. This process has three steps: awareness, exploration and preparation.

**Awareness** – This is the foundation to the entire

process. You need to know who you are and how you fit in the world of work. There are plenty of tools out there to help you with this process. Assessment tests can help measure your technical skills, academic skills, interests, personality style, learning style and values. These assessments also can help you understand your strengths and weaknesses, and connect you to career possibilities.

**Exploration** – In this step you will narrow your search and get more specific information on the careers that appeal to you most. You will need to know what types of skills are needed, what training programs can help you develop the skills, what is the pay range and labor market projections. Talk to people in the field for more detailed information, job shadow, volunteer or get an internship.

**Preparation** – This is the step that makes it all happen. You have a career goal and a map on how to get there. You coordinate financial resources. You enter the training program. You develop the necessary skills, you network, you create your portfolio, you prepare for interviews.

For more information on career planning, check out the resource section on page 15 of this publication, and you can contact Mona Schroeder-Beers at [schroeml@matc.edu](mailto:schroeml@matc.edu); 414-297-8488.



### Shaun Johnson

Graduate of Bay View High School,  
Milwaukee

Apprenticeship with Diversified  
Machine Inc.; classroom instruction  
at MATC

"I work in the tool room and I can apply hands-on what I learn in class. My future plans are to go to school for business and own my own business."

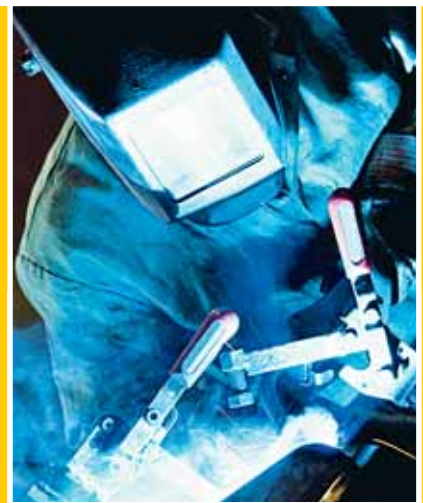
photo by John Krejci

# Payday

Throughout Wisconsin and the United States, there is a growing need for qualified candidates to fill advanced manufacturing job openings. Learn more about these different job opportunities at [www.bls.gov](http://www.bls.gov).

Career	Avg. Hourly Rate in Wisconsin	Yearly Salary
General factory, material handler	\$8.58 - \$18.64	\$17,800 - \$38,800
Machine tool operator, customer service, quality technician, administrative assistant	\$13.02 - \$24.64	\$27,100 - \$51,300
Inspector, machinist, computer control programmer, electrician, welder, metal fabricator	\$14.97 - \$26.81	\$31,100 - \$55,800
Group leader, supervisor, department manager	\$23.32 - \$42.15	\$48,500 - \$87,700
Project manager, estimator, purchasing agent, controller, safety engineer, materials engineer	\$25 - \$44	\$52,000 - \$91,500

Source: U.S. Department of Labor – Bureau of Labor Statistics



## Welders wanted

Jobs for welders, cutters and welding machine operators are expected to increase 5% in the next 10 years in the seven-county southeast Wisconsin region. Openings for welders will occur mainly due to the retirement of current workers.

Source: University of Wisconsin-Milwaukee Employment and Training Institute

## Benefits pay off too

To attract and retain skilled workers, manufacturers throughout Wisconsin offer their employees an array of benefits, such as:

- 401(k) retirement savings plan**  
(Many employers make company contributions to their employees' 401(k) accounts.)
- Medical plan**
- Dental plan**
- Vision plan**
- Life insurance**
- Disability benefits**
- Paid holidays and vacation**

Other benefit plans that may be offered:

- Employee assistance plan**
- Accidental death and dismemberment benefits**
- Long-term care insurance**
- Adoption benefit**
- Tuition reimbursement program**
- Health and dependent care spending accounts**
- Stock purchase plan**
- Auto/homeowners/renters insurance**
- Wellness resources**

## Occupation examples:

**Tool and die makers** create precision tools and machines, often using computer-aided design software, that are used to cut, shape and form metal and other materials to exact specifications.

**CNC machine operator.** Many machines today are computer numerically controlled (CNC). The operators of these machines type in specifications to adjust the machine's settings.

**Welding, soldering and brazing workers** operate machines that join two or more pieces of metal together; they may also weld manually as well.

**Inspectors and testers** make sure that individual parts, as well as the finished product, meet the quality standards set by the company.

**First-line supervisors and managers of production and operating workers** oversee workers in the production process and ensure that equipment and supplies are available.



### Joseph Mead

Graduate of Arrowhead High School, Hartland

Currently attending MATC

"I wanted to learn how to operate a screw machine. I like hands-on work and there is a high demand for this type of work in Milwaukee. I already have job offers for when I complete the program in May."

photo by John Krejci



# A career in high school?



by Robin Kroyer-Kubicek, youth apprenticeship curriculum specialist, University of Wisconsin-Oshkosh

Jim is a high school junior working his first job at the local fast food restaurant. The money is OK and the hours are flexible, but it is just a means to make some cash to pay for gas now that he has his own car.

Mike is a senior at the same high school and is in his second year working his first job for the local machining company down the road from school. Mike is making good money and just got a raise. The company has even taught Mike how to perform an advanced grinding procedure to produce the pieces to the company's specifications, an important step in the production process. Furthermore, Mike's job counts toward high school graduation credit and he gets to leave school early to go to his job.

Jim has a job, but Mike is already developing skills for a new career in manufacturing while he is still in high school.

## Manufacture your future

Standing by itself, U.S. manufacturing is the eighth largest economy in the world. Yet U.S. manufacturers are challenged as never before. They are on the front lines of the most intense, global competition in history and face the challenge of not finding enough qualified workers to fill open positions created by an aging, skilled work force.

## Youth apprenticeship

The Wisconsin Youth Apprenticeship Program was approved by the Wisconsin Legislature in 1991 to provide a direct link between businesses, schools and youth to meet the demands of technology,

teamwork, communication and leadership in today's global economy.

Wisconsin Youth Apprenticeship is a rigorous program that combines academic and related technical classroom instruction with mentored, on-the-job learning for high school students. The Wisconsin Manufacturing Youth Apprenticeship Program is designed to provide students with a working understanding of core, manufacturing industry skills and occupationally specific skills. This program provides the framework for educators and industry to work together to produce work-ready, entry-level employees who will compete favorably in a global market, as well as provide for post-secondary educational advancement, while integrating work-based learning in the school and work site.

Youth apprentices, parents, employers, YA program coordinators and school districts enter into a written agreement approved by the Department of Workforce Development. Statewide skills are established by the industry, making the youth apprentice skill set more relevant to the state's employers.

Youth apprentices are trained at the work site by skilled mentors and are paid minimum wage or better for their work. Students average 10 to 15 hours per week. Youth apprentices may receive advanced standing credit and/or transcribed credit for the YA program at a Wisconsin technical college and/or at some four-year colleges.

For more information, contact your local high school district's school-to-work coordinator, or Cathy Crary at Wisconsin's Department of Workforce Development, Youth Apprenticeship Programs, 608-267-7944.

Source: National Association of Manufacturers

## What's an apprenticeship?

An apprenticeship is a built-in formal training agreement (indenture) providing on-the-job training and related classroom instruction. It leads to a certificate of completion and official journeyman status. Participants are paid and the wages increase throughout the training.

For more information on Wisconsin apprenticeship programs, visit [www.dwd.state.wi.us/apprenticeship](http://www.dwd.state.wi.us/apprenticeship) or contact the Wisconsin Department of Workforce Development, Bureau of Apprenticeship Standards, 201 E. Washington Ave., Room E100, P.O. Box 7972, Madison, WI 53707; 608-266-3332.



photo by John Krejci

## David Miller

Graduate of Nathan Hale High School, West Allis

Tool and die apprenticeship with AFC Tool and Machine Company; classroom instruction at MATC

"In high school, I worked at AFC Tool as a co-op student, and then they offered me the apprenticeship. I enjoy it and there are a lot of opportunities."

## Milwaukee Public Schools and Project Lead The Way

If technical challenges grab your interest, then this program could be the lead you need toward a strong career. Project Lead The Way is a nationally established program focused on preparing our country's technical and engineering work force of the future. PLTW offers a middle school "Gateway To Technology" curriculum and a five-course high school curriculum. The program includes project-based courses meeting national science, math and literacy standards.

PLTW gets results – in early data, 73% of students taking three or more high school PLTW courses entered post-secondary engineering or technical programs. Of those students, 98% continued into their second year in their technical or engineering program. Students in PLTW programs also consistently score higher than their peers on national reading, science and math exams.

Visit [www.pltw.org](http://www.pltw.org) and the Wisconsin program's Web site [www.pltw-wi.org](http://www.pltw-wi.org); also MSOE state affiliate Web site [www.msoe.edu/pltw](http://www.msoe.edu/pltw) or contact Thor Misko, MSOE, state affiliate director, 414-277-7255.

# Manufacturing our future

By Phil Neuenfeld, secretary treasurer, WI AFL-CIO

As Homer Simpson would say: "D'oh!" The United States lost 16% of all its manufacturing jobs between 2000 and 2003. Since then we have lost an additional 4%. Wisconsin, which is more dependent on manufacturing than most states, has lost more than 100,000 manufacturing jobs since 2000.

Despite these job losses, the nation's 14 million manufacturing jobs in 2007 represented 10.1% of the nation's total employment. Manufacturing generated \$1.6 trillion in gross domestic product in 2006, 12.2% of the GDP including 64% of all U.S. exports.

Manufacturing is even more important to Wisconsin's economy than it is to the rest of the nation, representing 496,400 workers at 10,406 businesses, or 17.2% of all employment and 20.7% of the economy.

The average manufacturing worker in the United States earns a weekly wage of \$725, which is 20% higher than the national average.

Manufactured goods are a significant source of demand for goods and services from other sectors of the economy, ranging from energy and natural resources to construction of new factories to services provided by accounting, engineering, software, public relations, finance and even temporary help firms. Every manufacturing job generates up to four more in other sectors of the economy.

Manufacturing is one of the most dynamic sectors of the economy, responsible for 60% of all U.S. research and development spending in 2003. Scientists and engineers make up 9% of the manufacturing labor force, a share almost twice as great as the rest of the economy. As a result, manufacturing productivity growth rates have been 60% greater than in the private non-farm economy as a whole.

Given the nexus between research and development and manufacturing, a vital manufacturing sector is critical in maintaining an innovative economy.

It is also key to reducing greenhouse gas emissions and the nation's reliance on foreign oil. Manufacturing will contribute to these goals by adopting energy-efficient production techniques and by making equipment to produce renewable energy.

Renewable forms of energy such as wind and solar power rely on manufactured components to a greater extent than oil and other extractable energy sources. A vibrant manufacturing sector also is needed to supply the new materials that will be in demand for the low-carbon economy.

## Skilled worker shortage

The National Association of Manufacturers reports that America will face a shortage of 13 million skilled industrial workers by 2020. The Wisconsin Department of Workforce Development estimates that in the next six years there will be 70,000 replacement openings in Wisconsin's manufacturing sector.

A recent Georgetown University study estimates that 54% of all job openings will require post-high school to two-year associate degree technical training. High on the list of these high-demand, middle-skilled occupations are welders, machinists, maintenance mechanics and engineering technicians.

Efforts like Project Lead the Way, Wisconsin Youth Apprenticeship, Project Second Chance and the First Robotics Competition are steps in the right direction.

Because technological changes have impacted every phase of manufacturing, there is a critical need for highly skilled, technically competent workers who can use new technologies, create more complex products and adopt new production

processes and work-organization models. Highly trained and motivated workers are key to a firm's competitive advantage.

I believe that unions working in partnership with employers can build high-performance work organizations that implement efficient and lean manufacturing techniques. High-performance work organizations motivate employees who can self-manage, reducing overhead costs.

## Work force strategies

Targeted work force strategies and training programs like Gov. Doyle's Work Force Advantaged Program can coordinate the training necessary to respond to changes in the demand for skills.

Work force strategies also should make use of existing skill standards and credentialing programs such as Manufacturing Skill Standards Council certification to ensure that the necessary skills are being taught.

Locally, the Wisconsin Regional Training Partnership is an example of an initiative that promotes inter-regional cooperation among companies in key sectors of the economy. The partnership's programs prepare low-income, unemployed and young workers for careers in a wide range of targeted industries that pay family-sustaining wages.

I view our objective is to help preserve good jobs by modernizing the manufacturing sector, keeping vital firms competitive, channeling young workers and other job seekers into high-wage jobs and moving incumbent workers into rewarding careers.

I believe that using joint approaches to the challenges of change, manufacturing firms, unions and their public partners can help ensure that we maintain the highly skilled men and women needed to sustain America's families and strengthen our country's economic foundation.

## What's a union?

**A labor union is an organization of workers formed for the purpose of advancing its members' interests in respect to wages, benefits and working conditions.**

**One thousand unions which represent 250,000 members in the state are affiliated with the Wisconsin AFL-CIO.**

## Federal Tool and Engineering, Cedarburg

Federal Tool was established in 1925. In 2005, Dave Tomczek and Steve Moyer purchased the company from the founder's grandsons.

Following solid growth in 2006 and 2007, this manufacturer of custom, precision metal components and assemblies continued its success with record growth in the first quarter of 2008, according to Tomczek.

"The difference that allows us to compete is the creativity and skills of our workers," he said. "We look for people with good math and communication skills and who have a good work ethic. It's also important that employees continue to gain knowledge and refine their skills."

Federal Tool and Engineering has 40 employees and Tomczek said the company is committed to promoting from within and providing good wages. "The average salary our people make is \$40,000 a year, plus benefits," he said.

Tomczek describes the work environment as clean and organized with a relaxed, easy-going atmosphere where teamwork is highly valued. He said that safety is key and because of their record, Federal Tool was invited to apply for a state safety award.

Tomczek views careers in manufacturing as rewarding and challenging. "There are a lot of different jobs and opportunities in manufacturing. It is not routine; you constantly need to learn," he said.



### Derek Degnitz

Tool and die maker at Federal Tool  
Graduate of Random Lake High School  
Has associate degree in electro-mechanical technology  
Enrolled at Moraine Park Technical College for tool and die making

"The work we do is very precise. You have to use your head – you have to be thinking to keep on task. I use a computer and I do hands-on work."

# On the job



Motorcycle engines are built and prepared for shipping at Harley-Davidson powertrain operations in Wauwatosa.

photo courtesy of Harley-Davidson

such as windshields, fairings, saddlebags and sidecars for Harley-Davidson motorcycles.

- **Vehicle & Powertrain Operations in Kansas City, Mo.** – assembles Sportster, Dyna and V-Rod families of motorcycles. Produces V-Rod powertrains.
- **Final Assembly Operations in York, Pa.** – assembles Softail and Touring motorcycles, limited-production models and service parts and accessories.
- **Buell Motorcycle Company (East Troy, Wis.)** – produces Buell sport motorcycles and service parts.

## Harley-Davidson Motor Company, Milwaukee

Harley-Davidson has been a part of Milwaukee for 105 years. It has grown from its beginnings in a small shed on Highland Ave. to become a global leader.

The company has several operations in the Milwaukee area. The following is a brief description of each:

- **Headquarters on Juneau Ave.** – home to numerous business functions and corporate offices.
- **Powertrain operations in Wauwatosa** – produces engines and transmissions (powertrains) for Harley-Davidson Sportster motorcycles and Buell motorcycles, as well as service parts and accessories.
- **Powertrain operations in Menomonee Falls** – produces engines and transmissions for Harley-Davidson Touring, Dyna and Softail motorcycles, as well as service parts and accessories.
- **Distribution Center in Franklin** – distributes service parts and accessories to dealerships worldwide for the company's Genuine Motor Parts & Accessories business; manages packaging services provided by third-party co-packers.
- **Product Development Center in Wauwatosa** – home to product engineering and testing, styling, manufacturing engineering and purchasing. Takes motorcycles from concept to market.

Outside the metro Milwaukee area, Harley-Davidson has the following facilities:

- **Operations in Tomahawk, Wis.** – produces injection-molded components



### Kevel Anderson

Senior manufacturing engineer at Harley-Davidson  
Graduate of Harold S. Vincent High School, Milwaukee  
Has bachelor's degree in mechanical engineering from UW-Milwaukee and MBA from Cardinal Stritch University

"The fun thing for me is to see fresh designs, which will be the projects of the future."

photos by John Krejci

## Classroom activities using the Milwaukee Journal Sentinel

Teachers, here are projects your students can work on to learn more about manufacturing:

1. Virtually everything we use on a daily basis is manufactured. Have your students look through advertising in the Milwaukee Journal Sentinel to select products to research where and how they are made.
2. Have students look for articles in the Milwaukee Journal Sentinel about local manufacturing companies. Find out what types of equipment and technologies are used by these companies to manufacture their products.
3. Ask students to look at job openings listed in the Skilled Trades and Professional/Technical categories of the Milwaukee Journal Sentinel's classified advertising section. Research the positions at [www.labor.gov](http://www.labor.gov) or <http://worknet.wisconsin.gov/>
4. Tour a local manufacturing company and assign the students to report about the visit in the form of a newspaper article. Have students read articles in the Milwaukee Journal Sentinel for news-writing style.



Photo by John Krejci

### Karen White

Lead person/supervisor for assembly operations at Vulcan Industries  
Enrolled in MSSC training at MATC

"I am learning new skills to apply to my job now and in the future."

# Fun facts about advanced manufacturing

## How long does it take to make a jelly bean?

**Answer:** It takes seven to 10 days. After the center of the jelly bean, which contains its flavor, is made, it has to be cooled completely before it can get the right color. The jelly beans then go through the "painting" process several times. After the jelly beans are colored, they are inspected by machines and then by hand to make sure that they are the right color and size. Finally, the jelly beans can be packaged and shipped.



## What products are made from recycled plastic soda and juice bottles?

**Answer:** The bottles are used to make carpets, insulating materials in clothes and sleeping bags, auto parts, paintbrushes and other things, including tennis balls.

## How many 12-ounce soft-drink bottles can be filled in one minute?

**Answer:** About 850 bottles.

## How are CDs manufactured?

**Answer:** A compact disc, or CD, is a simple piece of injection-molded clear plastic, about 1.2 millimeters thick. Once the plastic is formed, a thin, reflective aluminum layer is placed onto the disc, followed by a thin, acrylic layer to protect it. The label is then printed onto the acrylic and the CD is finished. After the manufacturing process is complete, the CDs are ready for music.

## What is the largest manufacturing industry in the world?

**Answer:** The automobile manufacturing industry. There are about 400 million cars and light trucks in the world today.

## What are nanomaterials?

**Answer:** Nanomaterials are tiny materials manufactured atom by atom. A nanometer is one-billionth of a meter; 10 nanometers is 1,000 times smaller than the diameter of a human hair.

## What metal frequently used in manufacturing is compatible with human tissue and used as a biomaterial to replace human joints?

**Answer:** Titanium is light, strong, corrosion-resistant and easily formed. It also is used in airplanes, missiles and space shuttles.



## How many parts are there in a Boeing 747 airplane?

**Answer:** There are 6 million parts, half of which are fasteners. At 31,285 cubic feet, the 747-400 has one of the largest passenger-interior-volume of any commercial airplane, which is equivalent to more than three houses each measuring 1,500 square feet.

## How much paper is used in the United States each year?

**Answer:** Americans use about 187 billion pounds of paper a year.

Source: [www.careervoyages.gov](http://www.careervoyages.gov)

# Resource guide

Dozens of professional organizations, government Web sites and trade unions exist to help you learn more about advanced manufacturing careers. Here is a sampling of resources to get you started.

## Professional and Industry Organizations

American Academy of Environmental Engineers  
410-266-3311  
www.aaee.net

Accreditation Board for Engineering and Technology  
410-347-7700  
www.abet.org

Accrediting Commission of Career Schools and Colleges of Technology  
703-247-4212  
www.accsct.org

ACE Mentor Program  
203-323-8550  
www.acementor.org

Aerospace Industries Association  
703-358-1000  
www.aia-aerospace.org

American Chemical Society  
800-227-5558  
www.chemistry.org

American Design Drafting Association  
731-627-0802  
www.adda.org

American Institute of Aeronautics and Astronautics  
703-264-7500  
www.aiaa.org

American Institute of Chemical Engineers  
800-242-4363  
www.aiche.org

American Iron and Steel Institute  
202-452-7100  
www.steel.org

American Society for Engineering Education  
202-331-3500  
www.engineering12.org

American Society for Quality  
800-248-1946  
www.asq.org

American Society of Mechanical Engineers  
800-843-2763  
www.asme.org

American Society of Safety Engineers  
847-699-2929  
www.asse.org

American Welding Society  
800-443-9353  
www.aws.org

ASM International  
440-338-5151  
www.asminternational.org

Biomedical Engineering Society  
301-459-1999  
www.bmes.org

Board of Certified Safety Professionals  
217-359-9263  
www.bcsfp.org

Electronic Industries Alliance  
703-907-7500  
www.eia.org

Federal Aviation Administration  
866-835-5322  
www.faa.gov/education

IEEE Computer Society  
202-371-0101  
www.computer.org

Independent Electrical Contractors  
703-549-7351  
www.ieci.org

Industrial Designers Society of America  
703-707-6000  
www.idsa.org

Institute of Electrical and Electronics Engineers  
212-419-7900  
www.ieee.org

Institute of Industrial Engineers  
770-449-0460  
www.iienet.org

Junior Engineering Technical Society  
703-548-5387  
www.jets.org

Manufacturing Skills Standards Council  
202-429-2220  
www.msscusa.org

Minerals, Metals & Materials Society  
800-759-4867  
www.tms.org

National Association for Printing Leadership  
800-642-6275  
www.napl.org

National Association of Manufacturers  
202-637-3000  
www.nam.org  
(NAM is the nation's largest industrial trade association, representing small and large manufacturers in every industrial sector and in all 50 states.)

National Center for Integrated Systems Technology  
815-942-3180  
www.ncist.ilstu.edu

National Center for Manufacturing Education  
937-512-2365  
www.ncmeresource.org

National Council for Advanced Manufacturing  
202-429-2220  
www.nacfam.org

National Council of Examiners for Engineering and Surveying  
800-250-3196  
www.ncees.org

National Council of Textile Organizations  
202-822-8028  
www.ncto.org

National Electrical Manufacturers Association  
703-841-3200  
www.nema.org

National Electrical Contractors Association  
301-657-3110  
www.necanet.org

National Institute for Certification in Engineering Technologies  
703-548-1518  
www.nicet.org

National Institute for Metalworking Skills  
703-352-4971  
www.nims-skills.org

National Society of Professional Engineers  
703-684-2800  
www.nspe.org

National Tooling and Machining Association  
800-248-6862  
www.ntma.org

Precision Metalforming Association  
216-901-8800  
www.pma.org

Precision Machined Products Association  
440-526-0300  
www.pmpa.org

Printing Industries of America/Graphic Arts Technical Foundation  
800-910-4283  
www.gain.org

Rubber Manufacturers Association  
202-682-4800  
www.rma.org

Semiconductor Industry Association  
408-436-6600  
www.sia.online.org

Society for Mining, Metallurgy and Exploration  
800-763-3132  
www.smenet.org

Society of Automotive Engineers  
724-776-4841  
www.sae.org

Society of Manufacturing Engineers  
313-271-1500  
www.sme.org

Society of Petroleum Engineers  
800-456-6863  
www.spe.org

Society of Plastics Engineers  
203-775-0471  
info@4spe.org

Society of Plastics Industry  
202-974-5200  
www.plasticsindustry.org

Society of Women Engineers  
312-596-5223  
www.swe.org

Steel Manufacturers Association  
202-296-1515  
www.steelnet.org

Wood Products Manufacturers Association  
978-874-5445  
www.wpma.org

## Government Agencies

U.S. Department of Labor Employment & Training Administration  
877-872-5627  
www.doleta.gov  
www.careervoyages.gov

Occupational Safety and Health Administration  
800-321-6742  
www.osha.gov

## Manufacturing Unions

AFL-CIO  
www.aflcio.org

AFL-CIO Working for America Institute  
202-974-8100  
www.workingforamerica.org

Bakery, Confectionery, Tobacco Workers and Grain Millers International Union  
301-933-8600  
www.bctgm.org

United Auto Workers  
313-926-5000  
www.uaw.org

International Association of Machinists & Aerospace Workers  
301-967-4500  
www.goiam.org

International Brotherhood of Electrical Workers  
202-833-7000  
www.ibew.org

International Brotherhood of Teamsters  
202-624-6800  
www.teamster.org

International Union of Operating Engineers  
202-429-9100  
www.iuoe.org

National Electrical Contractors Association  
301-657-3110  
www.necanet.org

National Joint Apprenticeship Training Committee  
www.njatc.org

Sheet Metal Workers' International Association  
202-783-5880  
www.smwia.org

United Food and Commercial Workers  
www.ufcw.org

# Take the quiz for a chance to win

Fill in the answers and send them in to enter the prize giveaway. When you or your teacher sends completed quizzes to the address below, you will automatically be enrolled in the prize drawing.

**HIGH SCHOOL STUDENTS ONLY**

**Deadline: June 13, 2008.** Winners will be notified by phone by June 20, 2008. Incorrect answers do not disqualify entry in prize drawing. One entry per person.

1. The average pay for a manufacturing job in Wisconsin is almost \$46,000. TRUE or FALSE?
2. What is one of the top 12 critical skills cited by Wisconsin manufacturers? \_\_\_\_\_
3. Almost 50% of Wisconsin manufacturers employ more than 250 people. TRUE or FALSE?
4. In the exploration step of career planning, what is something you can do to learn more about a career? \_\_\_\_\_
5. CNC stands for \_\_\_\_\_ numerically controlled.
6. Jobs for welders, cutters and welding machine operators are expected to increase 5% in southeast Wisconsin in the next 10 years. TRUE or FALSE?
7. An \_\_\_\_\_ is a built-in formal training agreement (indenture) providing for on-the-job training and related classroom instruction.
8. The National Association of Manufacturers reports that America will face a shortage of 13 million skilled industrial workers by 2020. TRUE or FALSE?
9. List two job titles associated with manufacturing: \_\_\_\_\_ and \_\_\_\_\_
10. Nanomaterials are tiny materials manufactured atom by atom. TRUE or FALSE?
11. Milwaukee was called the \_\_\_\_\_ capital of the world by Forbes magazine in the 1950s.
12. In 1910, 25% of Milwaukee's male labor force was employed in manufacturing. TRUE or FALSE?

## ENTRY FORM

Your name, grade \_\_\_\_\_  
 School name \_\_\_\_\_  
 Teacher name \_\_\_\_\_  
 School phone number \_\_\_\_\_

To enter: Mail form to  
 NIE Manufacturing Careers Section  
 Milwaukee Journal Sentinel  
 333 W. State St.  
 Milwaukee, WI 53203

OR: fax to 414-224-0777  
 OR: e-mail your answers and  
 contact information to  
 NIEADMIN@journalssentinel.com

## Prizes!

\$100 Best Buy gift card (4 winners) • \$50 Best Buy gift card (2 winners)

Deadline to enter: June 13, 2008. See details above. Winners will be notified by phone before June 20, 2008.

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United Steel Workers - District 2

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## Thank you!

The Milwaukee Journal Sentinel's "Manufacturing Careers" program gives students an overview of manufacturing past and present, offers tips for career planning and provides an inside look at jobs available at Wisconsin manufacturers.

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