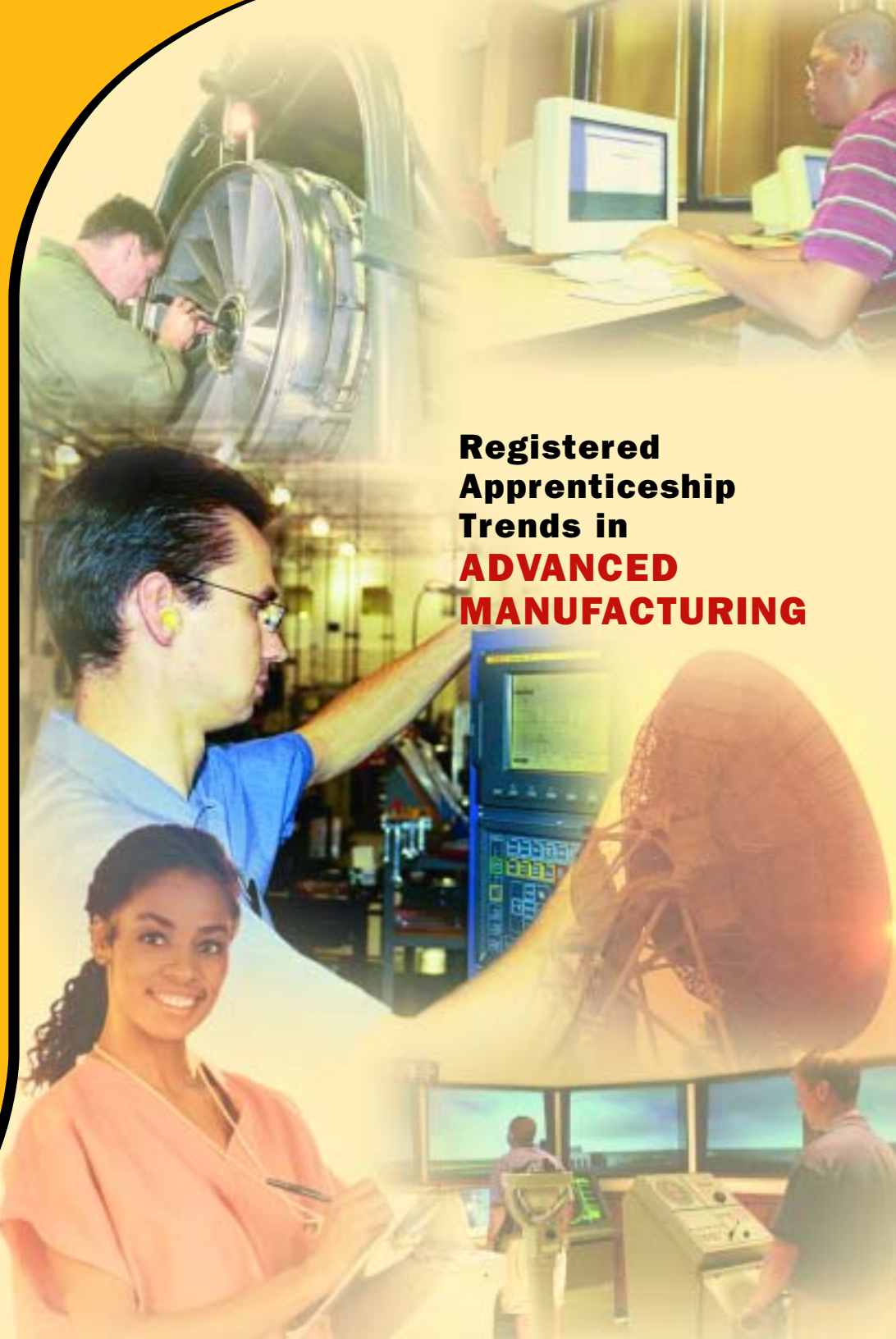
# Strengthening Our Nation's Workforce

## with Demand-Driven Solutions



## Registered Apprenticeship Trends in ADVANCED MANUFACTURING


**Office of Apprenticeship**
**Anthony Swoope, Administrator**

**Employment and Training Administration**
**United States Department of Labor**

# Registered Apprenticeship In Advanced Manufacturing


Registered Apprenticeship training plays an important role in developing skilled workers. With the combination of on-the-job learning, related instruction, mentoring, and incremental wage increases, the apprenticeship model can be an effective system for addressing human resource issues and skill shortages that many industries/businesses face. Registered Apprenticeship can provide the expertise and knowledge individuals need to do their jobs effectively and advance in their careers.

Twenty-first century apprenticeship allows for a flexible competency-based training strategy that enables apprentices to move through a program at their own pace, benchmark the achievement of each set of core competencies and build a portfolio of skills and interim credentials that validate the acquired skill levels. Additionally, the related instruction is articulated with many two- and four-year colleges, allowing apprentices to work toward a degree. This is good news for the manufacturing industry because it meets many of their human resources and skills training needs.

The U.S. manufacturing sector faces a very difficult challenge: how to keep production here in the U.S. and still be competitive in the global market. The national Institute for Metalworking Skills (NIMS) developed an innovative, competency-based apprenticeship training model that addresses training for the skills workers need to do their jobs well. NIMS is working with some 36 manufacturers nationwide to implement the model. Manufacturers find that the program greatly improves retention, on-time delivery, and productivity.

The Registered Apprenticeship model has proven its ability to address these and other issues in other industries and has become part of the human resources and training strategy for advanced manufacturing. The model offers an efficient, flexible training system that is responsive to new technology to keep workers up-to-date on skills they need to do their jobs.

The U.S. Department of Labor (DOL), Employment and Training Administration (ETA), Office of Apprenticeship (OA) has made a strategic decision to introduce the model to advanced manufacturing.

Recently, DOL approved NIMS guideline standards for the following six occupations:

- Machinist
- CNC Programming, Setup & Operations - Turning
- CNC Milling
- CNC Turning & Milling
- Press Setup Operator
- Machine Maintenance, Service & Repair

"Advancing the Apprenticeship System" is one of the department's key initiatives, with investments of more than $15 million to fund apprenticeship programs in new industries through the President's High Growth Jobs Training Initiative. They include:

- Biotechnology
- Health Care
- Advanced Manufacturing
- Information Technology
- Maritime Trades - Transportation
- Military - Indiana National Guard
- Geospatial Technology

The following case study looks at results of investments and marketing efforts in advanced manufacturing. There are promising trends that point to the value of apprenticeship:

**Benefits to Employers**

- Greater competence of employees
- Reduced turnover rates
- Greater employee retention
- Lower investment in recruitment
- Higher productivity
- Improved quality of products and services
- More diverse workforce

**Benefits to Apprentices**

- Nationally recognized and portable certificates
- Improved skills and competencies
- Increased wages as a result of mastered competencies
- Ability to advance in career
- Higher self-esteem based on enhanced skills and certifications
- Articulation argeements for post-secondary credit

## Industry:
# ADVANCED MANUFACTURING

The nation's vast advanced manufacturing industry is expected to add over 150,000 new jobs between 2004 and 2014. Jobs in metalworking will see the largest percentage of growth over the next decade.

- Skilled worker shortages and technological advances will lead to demand for metalworkers in areas such as computer-control programmers and operators, welders, cutters, solderers, brazers, and machinists.
- Manufacturing salaries and benefits average $65K.
- Most jobs in metalworking require long-term to moderate on-the-job training, but engineering and management positions require four-year college degrees.

*Sources:*
*- Bureau of Labor Statistics, 2007*
*- Keeping America Competitive: How a Talent Shortage Threatens U.S. Manufacturing, a report from the Center for Workforce Success, 2004*
*- National Association of Manufacturers*



# Competency-based Training and Recognized Standards Increase Competitiveness

## Project Overview

DOL awarded the National Institute for Metalworking Skills (NIMS), based in Fairfax, Virginia, a two-year grant, which began in 2003. The grant's purpose was to further development of a competency-based Registered Apprenticeship system within the industry.

Created by the major metalworking trade associations in 1995 as a nonprofit educational organization, NIMS has developed industry-driven national skill standards that set a benchmark for competency in the metalworking industry. NIMS used the grant to identify specific competencies required to attain different skills and skill levels.

NIMS also developed a competency-based training curriculum for specific skill sets related to metalworking occupations and to pilot the curriculum at selected training sites. Throughout the development process, NIMS worked closely with an expert panel that represented metalworking companies and trade associations. The panel selected eight occupations and associated core competencies to target for the pilot project.

For more than 20 years, the nation's metalworking industry has experienced a massive transition from manually operated machines to computer numerically controlled (CNC) machines. This change demanded that both new and existing workers be trained on the CNC machines. Although many metalworkers receive introductory training to machining and metalworking through high school or postsecondary programs before entering the workforce, most training occurs on the job.

NIMS currently offers 46 credentials for various skill sets needed for manual and CNC machining, metal forming, stamping,

press brake, slide forming, screw machining, machine building, and machine maintenance. Additional credentials are under development. According to NIMS staff, increased use of the competency-based Registered Apprenticeship training model has helped establish unified skill standards throughout the industry.

The NIMS training system uses a career lattice that allows for cross-lateral movement across occupations and skill sets, as well as for progress to higher levels of competency in the same occupation. The expert panel works with NIMS to develop a series of Career Webs to illustrate the specific, and often overlapping, skill sets related to the industry's four major occupational areas: machining; metalforming; tool, die and mold-making; and machine building and maintenance occupations.

Using feedback from pilot sites, curriculum guides were completed and readied for use in 2005. Given strong backing by the industry, Registered Apprenticeship training programs have continued long past the end of the DOL grant. NIMS also continues to develop competency-based training curricula for additional occupations within the metalworking industry.

The primary workforce need in the metalworking industry is finding qualified new workers with strong math skills and adequate soft skills who are willing to train for high-tech occupations in machining and metal forming. NIMS staff anticipate that use of a competency-based Registered Apprenticeship model will continue to attract and retain qualified workers; increase productivity, quality, and customer satisfaction; and give employers a better return on investment.

## Role of Registered Apprenticeship

Support from apprenticeship representatives from both federal and local governments (SAC and OA staff )was crucial to the NIMS competency-based training effort, according to NIMS staff. Their involvement, staff members said, gave NIMS increased credibility as the NIMS staff has reached out to new companies that might adopt the Registered Apprenticeship training model.

National and local apprenticeship staff are assisting in implementation of competency-based Registered Apprenticeship training throughout the industry. Following their own training in the NIMS standards, they are equipped to share their knowledge about implementation of the training model in the metalworking industry with local employers and trade associations.

## Workforce Challenges

State workforce professionals and senior executives within the metalworking industry identified the following workforce challenges:

### Recruitment and Retention

- Few qualified new workers willing to train for high-tech occupations in machining and metal forming
- Negative attitudes about manufacturing as a physically hard and dirty job
- Insufficient marketing to dislocated workers

### Education and Training

- Increased need for high-tech training
- Few educational institutions willing to provide modular training to small classes at flexible hours and locations on an as-needed basis
- Increased desire of workers to receive college credit for training completed
- Insufficient sources of effective online learning options

### Workforce Diversity

- Limited access to high-tech training for individuals with limited English skills
- Insufficient marketing of career opportunities to youth, young adults, women, and minorities

Employers and other industry stakeholders said they find that bright young job seekers are attracted to Registered Apprenticeship programs. That is because competency-based Registered Apprenticeship allows them to train on the job, progress at their own speed, earn college credit, achieve nationally recognized credentials, and become eligible for wage increases at a faster rate than with typical time-based apprenticeship programs.

Dislocated workers with experience in manufacturing are also attracted to companies that recognize previously acquired skills through credentials and offer them a chance to demonstrate their skills through a competency-based program. Likewise, existing workers continue to respond well to the opportunity to gain added credentials and increase their standing in the company, according to NIMS staff members.

NIMS staff members expect that competency-based Registered Apprenticeship training increases the retention of employees because apprenticeship encourages them to take personal responsibility for their own career paths. Having a career lattice and required competencies helps workers plan a path toward credentialing and to select additional skill sets they would like to attain.

Providing workers the opportunity to progress at their own rate allows them to find a level of study and work that feels good to them, acc-ording to employers. If workers receive recognition for hard work through national credentials and earn wage increases, they are more likely to be satisfied at work and remain with the company. One employer noted that the turnover rate at his company has been almost nonexistent after he implemented a Registered Apprenticeship several years ago. The employer said he expects this pattern of retention to continue under a competency-based system.

Human resources personnel said they anticipate that the widespread use of NIMS credentials will make the recruitment process more efficient because employers will know an individual's skills before hiring. In addition, competency lists can be used to describe specific skills needed for a particular job opening, which will help service providers who refer potential new hires.

## Role of Educational and Training Organizations

Community colleges are finding ways to meet employer needs by providing instruction at flexible times and convenient locations. The use of defined national competencies makes it easier for schools to align their course credit requirements with the NIMS curriculum; therefore, more schools are willing to grant college credit for Registered Apprenticeship-related instruction.

Colleges and other training vendors that have or are currently participating in the project include:

- Butler County Community College (PA)
- Penn State University (New Kensington campus)
- College of DuPage (IL)
- Tooling University (online training)
- New Century Careers (PA)
- College of Lake County (IL)
- Marshall University (WV)
- New Century Careers (PA)
- Westmoreland Community College (PA)

All related instruction for Oberg Industries apprentices is held on site with curriculum provided by community colleges or specialized vendors. Apprentices have the option of taking job-related courses at Butler County Community College, for which the employer will pay. Vendor-provided, online learning is available during the workday in the company's computer lab.

## Employer Profile

Penn United Technologies, Inc. is an industry leader offering a complete range of precision metal manufacturing. Founded in 1971, the employee-owned company employs approximately 690 full-time workers at its primary production site in Cabot, Pennsylvania and 25 workers at a machining facility in Costa Rica.

Penn United's growth rate in the late 1990s, coupled with its inability to find "shop ready" workers, led it to build its own 17,000 square foot corporate learning center - the Learning Institute for the Growth of High Technology (L.I.G.H.T.). The company feels that the NIMS credentials incorporated into their Registered Apprenticeship program have given Penn United a competitive edge in the global marketplace. The training has increased the speed and accuracy of production and reduced waste. Penn United President William Jones noted that, "the NIMS competency-based credentialing system is an excellent complement to our existing courses and allows us to develop these much in demand crafts persons in the most efficient and effective manner."

According to Chuck Guiste, L.I.G.H.T. training director, instruction at Penn United starts for most new hires in a program called "Basic Training." New hires are assigned to L.I.G.H.T. for their first six weeks of employment. They attend basic math, blueprint reading, and metrology classes for the initial two weeks and then continue with machining and grinding theories, courses and hands-on application for the remaining four weeks. After completing Basic Training, the new hires are placed into a production role. The next phase of training for a new employee is entry into a company certificate program or one of five Registered Apprenticeship programs (NIMS Machinist, NIMS Press Technician, NIMS Tool and Die Maker, Precision Grinder, and Quality Technician) lasting approximately two-to-five years.

"NIMS credentials are a perfect compliment to our training objectives. We still believe that the best way to train someone is through instructor-led theory classes followed immediately by hands-on application where you continually coach apprentices one-on-one and expose them repeatedly to the skills until they can master the task without instructor assistance," said Mr. Guiste. "Every apprentice needs to prove his or her competence to the same national standard and naturally some achieve that faster than others, so this is why the NIMS competency-based system is so effective for us.

### Employer Sponsors:

- Admiral Tool & Manufacturing Co. (Chicago, IL)
- Alcon Manufacturing (Sinking Spring, PA)
- Buhrke Industries (Arlington Heights, IL)
- Camcraft, Inc. (Hanover Park, IL)
- Criterion Tool & Die (Brook Park, OH)
- Danly IEM (Cleveland, OH)
- Elray Manufacturing Co. (Glassboro, NJ)
- GMT Corp. (Waverly, IA)
- Hydromat (St. Louis, MO)
- Inland Technologies (Fontana, CA)
- Jergens (Cleveland, OH)
- McNally Industries (Grantsburg, WI)
- Metric Machining & Subsidiaries (Ontaria, CA)
- Morgal Machine Tool Co. (Springfield, OH)
- Oberg Industries (Freeport, PA; Chandler, AZ)
- Olson International (Lombard, IL)
- Penn United Technology (Saxonburg, PA)
- Pittsburgh Chapter, National Tooling and Machining Assn. (Pittsburgh, PA)
- P-K Tool & Manufacturing Co. (Chicago, IL)
- ProMold (Cuyhahoga Falls, OH)
- Southern Manufacturing Technologies (Tampa, FL)
- Timken (Lebanon, NH; Canton, OH)
- Accrotool (New Kensington, PA)
- Astro Automation (Irwin, PA)
- Eaton Hydraulics (Eden Prairie, MN)
- Hamill Manufacturing (Trafford, PA)
- Hope Industries (Madisonville, TN)
- JATCO (Pittsburgh, PA)
- Jennison Manufacturing Group (Carnegie, PA)
- Kurt J. Lesker Company (Clairton, PA)
- McCullough Machine (New Derry, PA)
- PennState Tool and Die (North Huntingdon, PA)
- U. S. Department of Defense
- Wright Industries (Nashville, TN)

## Apprentice Profiles

**Jim Jackson (top) and Dustin Gray**
Apprentices
Oberg Industries
Freeport, PA

Jim Jackson, an apprentice at Oberg Industries in Freeport, Pennsylvania, was a vocational technical school student before he was hired in summer 2002. He said he likes the competency-based apprenticeship approach because he gets to learn a greater range of skills by working in different job capacities. The variety keeps him from getting bored and also allows his supervisor to observe his skill level with various tasks and thus help assign him to the most-suitable work. Jim now works in the grinding department at Oberg. He said he likes the opportunity to learn at his own rate, which has made him eligible for frequent pay raises as he progresses through the competencies.

Another apprentice, Dustin Gray, was working in a restaurant when he learned about Oberg's Registered Apprenticeship program through his father's former employer. He applied for a position at Oberg because of the apprentice-ship training and the higher wages. He now works in the punch and die department as a cylindrical grinder.

Before coming to Oberg, Dustin said he knew nothing about the metalworking industry, but has found the work both challenging and rewarding. At his previous job, he rarely got more than 30 hours work each week, but at Oberg, he has taken on more responsibility and works 50 hours a week. He said he likes the competency-based Registered Apprenticeship program because it rewards hard work through wage increases based on how much of the program is completed. In addition, Dustin said, it offers the potential for cross training in other parts of the plant and provides opportunities for advancement within the company.



Near Chicago, Camcraft developed a successful partnership with the College of DuPage (COD). All related instruction classes are provided on site in the Camcraft plant's training area. However, if an apprentice wants to take a particular class before it will be offered again at Camcraft, he or she may enroll in a class at COD and the employer will pay the fee. Courses can be counted toward college credit, if desired. COD also is testing use of online, web-assist courses.

At the national level, DOL helped NIMS negotiate with a university to grant credit for related instruction that uses the NIMS curriculum. Currently, 42 college credits are available for NIMS credentials. This agreement may motivate other colleges and universities to partner with metalworking Registered Apprenticeship training programs. Another important educational resource is the web-based training available through Tooling University (www.toolingu.com).

# Preliminary Observations

Registered Apprenticeship, using the NIMS competency-based training model, addresses the workforce needs of the metalworking industry in many ways, including recruitment and retention, employee skills, and quality production, according to those who were interviewed. All partners apparently benefit, including employers, employees/apprentices, customers, trade associations, educational institutions, and the workforce development system.

Those who were interviewed said that the competency-based Registered Apprenticeship system offers standardization of skills across the industry, makes hiring practices more consistent based on a person's credentials, gives employers a better return on their investment, and motivates employees to work harder to achieve competency level skills.

## Recruitment and retention:

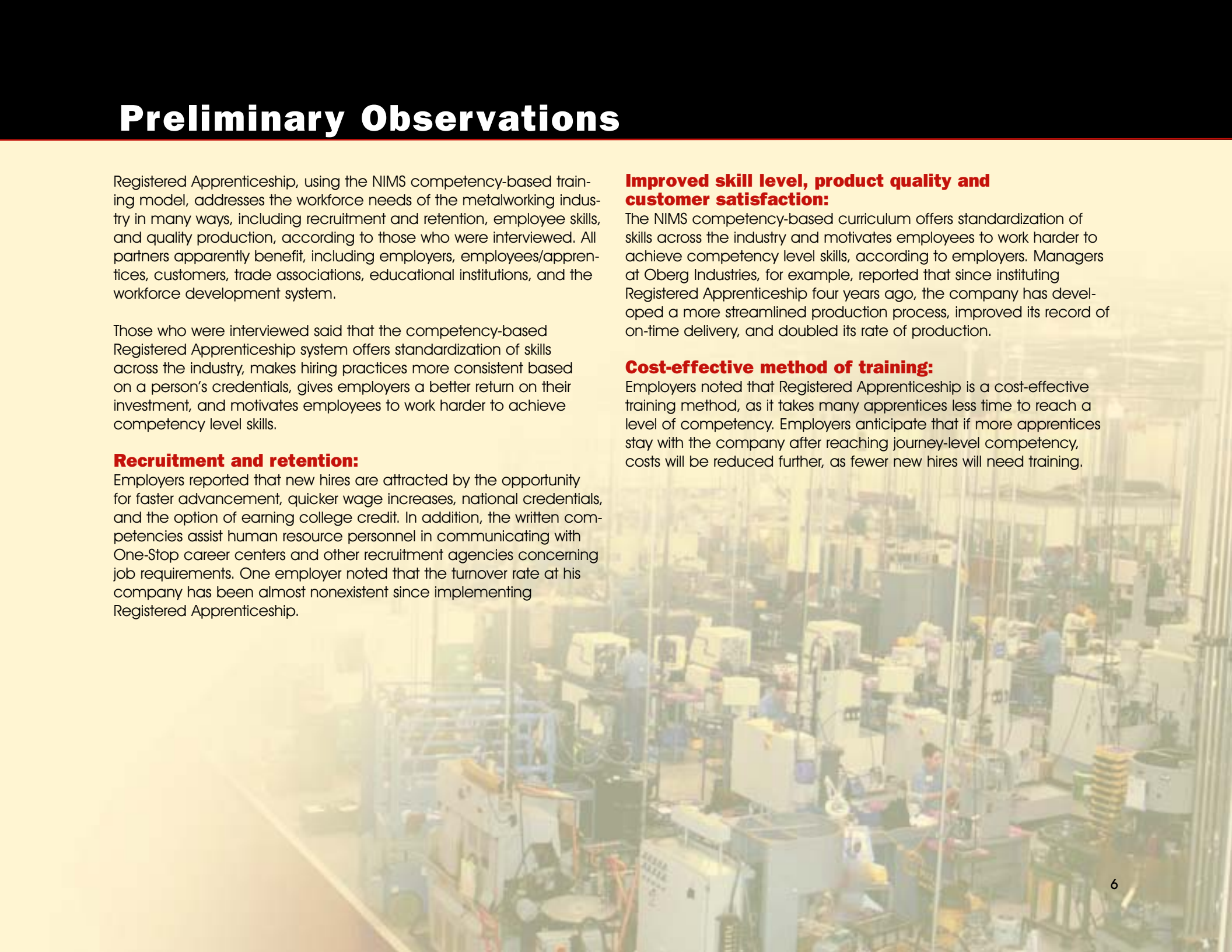
Employers reported that new hires are attracted by the opportunity for faster advancement, quicker wage increases, national credentials, and the option of earning college credit. In addition, the written competencies assist human resource personnel in communicating with One-Stop career centers and other recruitment agencies concerning job requirements. One employer noted that the turnover rate at his company has been almost nonexistent since implementing Registered Apprenticeship.

## Improved skill level, product quality and customer satisfaction:

The NIMS competency-based curriculum offers standardization of skills across the industry and motivates employees to work harder to achieve competency level skills, according to employers. Managers at Oberg Industries, for example, reported that since instituting Registered Apprenticeship four years ago, the company has developed a more streamlined production process, improved its record of on-time delivery, and doubled its rate of production.

## Cost-effective method of training:

Employers noted that Registered Apprenticeship is a cost-effective training method, as it takes many apprentices less time to reach a level of competency. Employers anticipate that if more apprentices stay with the company after reaching journey-level competency, costs will be reduced further, as fewer new hires will need training.



## Apprenticeable Occupations Include:

- Machinist
- Tool and die maker
- Mold maker
- Machine builder
- Machine maintenance and service repair technician
- CNC specialist - milling
- CNC specialist - turning
- Press set-up and operation - stamping



## Role of Workforce Development System

NIMS has worked extensively with One-Stop career centers in different parts of the country and with state and local workforce investment boards (WIBs). NIMS staff said they hope that providing One-Stop staff members with clear competency-based requirements for jobs will improve the quality of candidates referred to companies. They also hope that offering national credentialing will attract motivated job seekers to manufacturing jobs.

In Pennsylvania, Oberg Industries successfully developed a relationship with the county's One-Stop, called "CareerLink," which is now considered one of their best sources for new hires. In addition to providing job seekers access to manufacturing employers through job fairs, CareerLink staff members also conduct informal assessments of an individual's interests and abilities and try to match these with employer qualifications.

## For More Information

Office of Apprenticeship
U.S. Department of Labor

**www.doleta.gov/oa**
**1.877.872.5627**

Advanced Manufacturing
**www.nims-skills.org**

U.S. Department of Labor
Employment and Training Administration
Office of Apprenticeship
200 Constitution Avenue, NW
Washington, D.C. 20210

www.doleta.gov/oa
1.877.872.5627