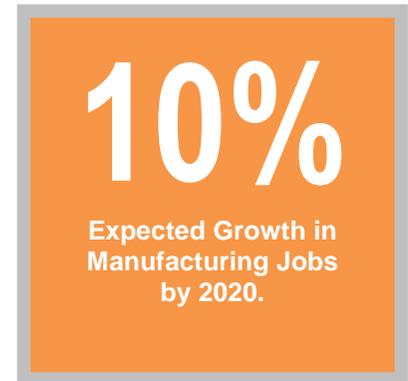


MANUFACTURING IN VIRGINIA

Welcome to the Manufacturing in Virginia Career Cluster Brief. Despite declines in recent decades, manufacturing remains a critical part of the U.S. economy. In fact, the United States has the second largest manufacturing sector in the world, reports [Facts About Manufacturing 2012](#).

While a postsecondary degree is not essential in this industry, most manufacturing jobs require specific training beyond a high school degree. Students interested in manufacturing will benefit from hands-on experience, either in the form of project-oriented learning, internships, apprenticeships, or training through their employers. This brief reviews not only this educational data, but also discusses trends in employment, highlights state priorities in the industry, and seeks to address concern over what is often termed the manufacturing “skills gap.”



STATE PRIORITIES IN MANUFACTURING

Over the last few years, manufacturing has experienced mixed success in Virginia. According to *Facts About Manufacturing 2012*, between 2006 and 2011, the contribution of manufacturing to the gross state product rose 19 percent, even as employment in the sector dropped 21 percent over the same period. This represents the paradox of manufacturing in the United States and Virginia: While economic factors are responsible for some of the reduction in jobs, the sector is also pushing innovation, moving towards “lean manufacturing,” and pursuing more flexible production processes, all of which allow for greater productivity and profits, with fewer workers.

Virginia has a place in this rapidly changing industry. The Commonwealth is home to largest Volvo Truck assembly plant in the world, located in the New River Valley, and the Crosspointe Rolls-Royce facility producing engines for Boeing and Airbus. In addition, there are several ways Virginia excels in the current manufacturing environment.

Research & Development

The ability to innovate, driven largely by advancements from research and development, is the “most important capability” for the success of companies, and countries in global manufacturing, according to a [Deloitte report on the future of manufacturing](#). The United States is one of the international powerhouses for research and development of advanced manufacturing.

To capitalize on the need for research and development, and to create a way to share the costs and risks of the process, the [Commonwealth Center for Advanced Manufacturing \(CCAM\)](#) opened in March of 2013 in Prince George County. A private-public partnership, CCAM brings together companies such as Rolls-Royce, Cannon, Airbus, and Siemens with the University of Virginia, Virginia Tech, Virginia State University, and NASA to work collaboratively on issues of manufacturing. This uncommon partnership—the only one of its kind in North America—allows member organizations to benefit from all the breakthroughs on projects conducted at the facility, not just their independent efforts. The success of CCAM depends on workers with **advanced degrees** to carry out this research.

Shipbuilding & Repair

Virginia is the national leader in private shipbuilding and repairing. [According to the Maritime Administration](#), private shipbuilding completed in the Commonwealth represented roughly one quarter of the industry's impact on the *national* GDP in 2011, almost twice that of the next closest state. These private shipbuilders construct and repair commercial and military ships of all sizes. The largest shipyard, Huntington Ingalls Industries, is located in Newport News and is one of only a handful of shipyards in the country "capable of building naval or deep-draft ocean-going commercial ships", or container ships, [according to Defense News](#). In addition to the private facilities, Norfolk Naval Shipyard, the Navy's oldest and largest shipyard, also contributes to vitality of shipbuilding in the Commonwealth.

Because Defense contracts drive much of the private shipbuilding industry, there is limited outsourcing or foreign involvement. Even in the event of cuts to the defense budget, it is likely to continue being it a stable part of Virginia's economy for the foreseeable future. The Manufacturing Institute [reports](#) that prospective shipbuilders need **strong STEM skills** in addition to **more hands-on training**, such as welding and experience working with metals.

Virginia Beach: "Manufacturing Boomtown"

The Virginia Beach region is known for more than shipbuilding, however. In 2013, [Forbes ranked the area as number seven](#) on its list of "New Manufacturing Boomtowns" because of its role in leading the "U.S. manufacturing revival". In particular, *Forbes* praised the diverse range of products produced in the region. The Virginia Beach Department of Economic Development [reports](#) that 63,000 employees produce products ranging from power tools to automotive seat parts to industrial pressure valves. The specific skills required vary based on the type of products, but production skills are crucial for these highly technical jobs.

In addition, dozens of distribution centers take advantage of the Port of Virginia, the third largest on the East Coast, and its rail access to the Midwest. Furthermore, Virginia Beach is a Free Trade Zone, allowing companies to receive tax and tariff benefits for manufacturing and exporting goods in the Commonwealth, while providing jobs for Virginians. These centers need employees trained in **logistics** and **inventory control**, as well as **transportation**.

EDUCATION, EMPLOYMENT & EARNINGS: ANALYZING DATA FROM MANUFACTURING

Manufacturing comprises almost 7 percent of jobs in Virginia. Employment levels in many goods-producing industries like manufacturing have been affected by increasing degrees of automation and off-shore outsourcing. However, despite the introduction of sophisticated equipment and international competition, the manufacturing cluster in Virginia is expected to grow by 10 percent through 2020, providing employment for nearly 300,000 workers. The diverse career pathways within the sector will witness varying levels of growth; for instance, opportunities for both Computer-Controlled Machine Tool Operators and Security and Fire Alarm Installers are expected to expand, while jobs for Semiconductor Processors are projected to decline by 2020.

GROWTH by 2020

Computer-Controlled Machine Tool Operators: 27%
Semiconductor Processors: -23%
Security and Fire Alarm Installers: 36%

This career cluster can be disaggregated into 4 primary pathways: Production; Manufacturing Production Process Development; Maintenance, Installation & Repair; and Quality Assurance. The following sections analyze data for the different occupations within Manufacturing in terms of the 3 E's: **education, employment, and earnings**.

Education

Educational attainment varies across manufacturing occupations. Jobs requiring at least some high school education and additional training or work experience make up the largest share (61 percent). Figure 1 shows the predominant level of education for various pathways in the manufacturing career cluster. Production has less rigorous academic requirements with 92 percent of its jobs needing a high school degree or less (with training or certification plus work experience). A third of the occupations under both Maintenance, Installation & Repair and Quality Assurance have workers with some college or associates degrees as well as further training and work experience. The only occupations requiring a bachelor's degree or more in addition to some training/certification are Industrial Production Managers along with Purchasing Agents (with the exception of those for wholesale, retail and farm produce).

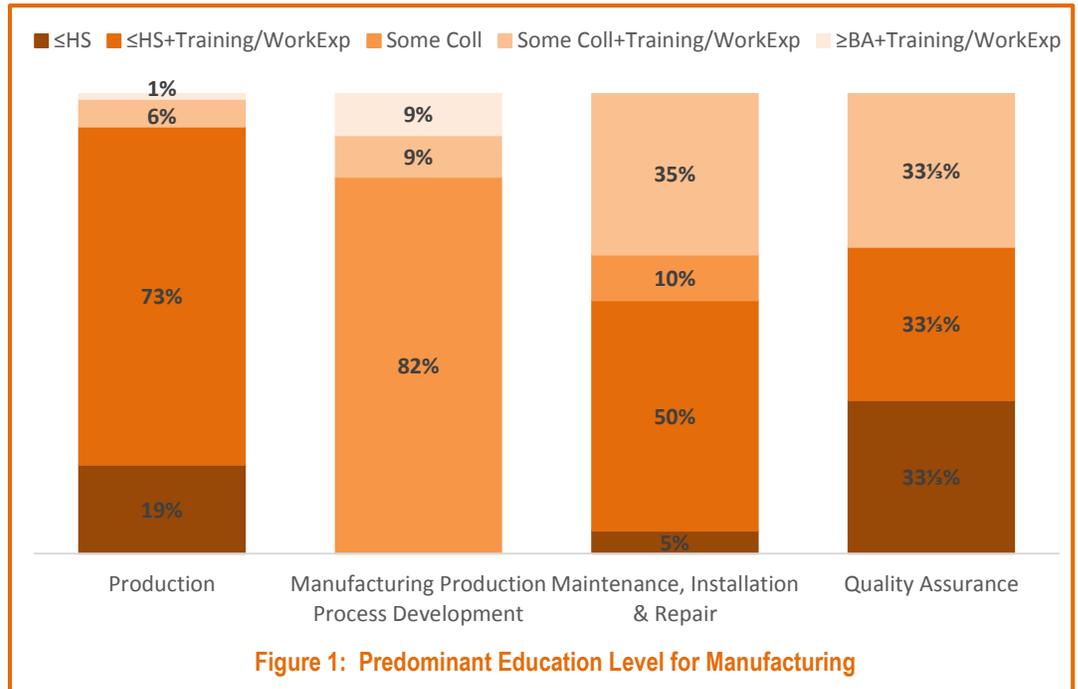


Figure 1: Predominant Education Level for Manufacturing

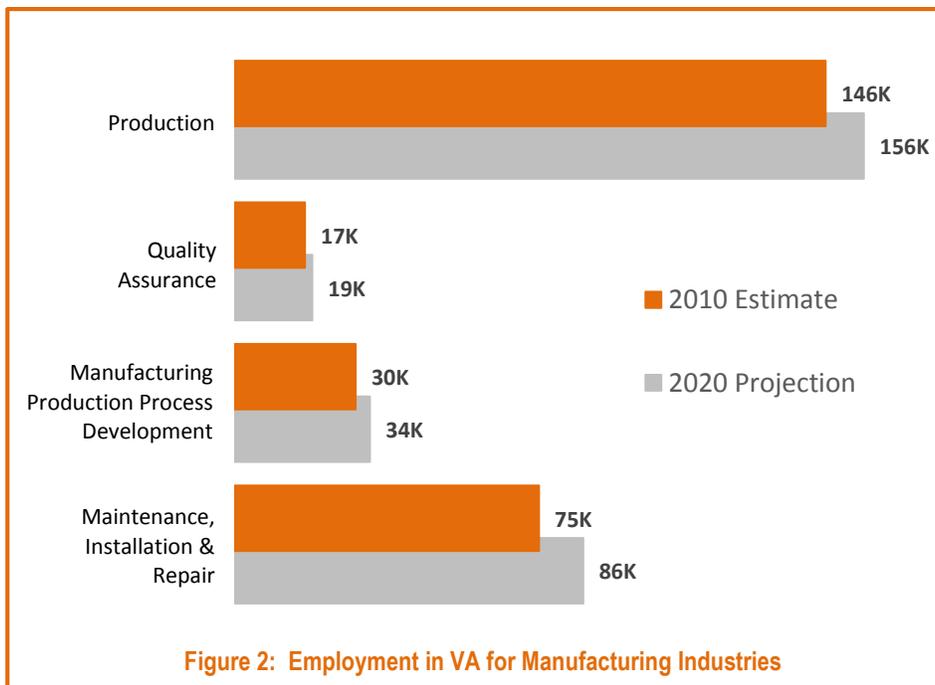


Figure 2: Employment in VA for Manufacturing Industries

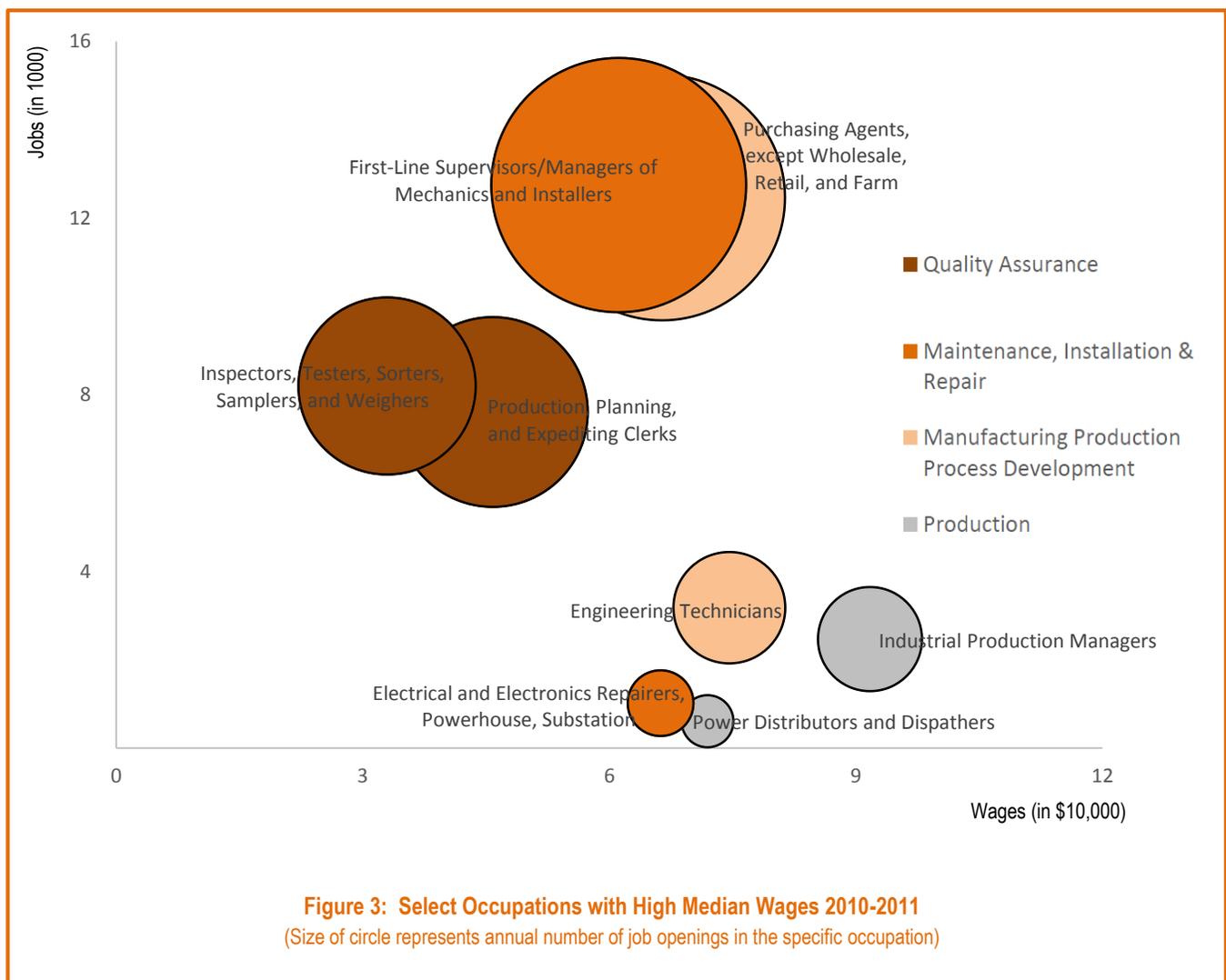
Employment

As per Figure 2, employment across all 4 pathways in manufacturing is expected to grow over the years until 2020. With close to 156,000 jobs, Production will offer the highest employment while Maintenance, Installation & Repair is projected to have the highest *growth rate* at 15 percent. Both Quality Assurance and Manufacturing Production Process Development will also experience a healthy increase in employment at 10 percent and 12 percent respectively. Among the specific occupations within the pathways,

General Maintenance and Repair Workers currently employ the largest number of people and will continue to be the biggest pathway with nearly 36,000 workers in 2020. Overall, 295,000 jobs are expected for the entire cluster, which translates to a 10 percent growth rate for manufacturing across the decade.

Earnings & Growth

Figure 3 compares career growth in terms of current employment, wages, and job opportunities for the top 2 wage-earning occupations for each manufacturing pathway. Industrial Production Managers are recorded to have the highest median wage exceeding \$91,000, and they are followed by Engineering Technicians (except drafters), and Power Distributors and Dispatchers, with both occupations earning median wages above \$71,000.



Projected job growth differs across sub-specialties in manufacturing: all occupations will see growth, but at varying degrees. First-Line Supervisors/Managers of Mechanics and Installers are projected to have the highest number of job openings with more than 500 positions becoming available annually. Over the years until 2020, the manufacturing industry is expected to yield more than 8000 employment opportunities annually.

IS THERE A SKILLS SHORTAGE IN MANUFACTURING?

There is frequent talk of a “skill shortage” or “skills gap” in the manufacturing industry. This phrase implies that employers in manufacturing seek more highly-skilled employees than they *find*. The skills referenced in this “skills shortage” are not always defined, but the phrase usually refers to a lack of applicants able to read and write moderately complex documents; demonstrate higher-order mathematical understanding (e.g. trigonometry); and use computer-aided design or modeling. What evidence exists to support this “skills shortage?” And if there is, in fact, reason to believe that one exists, what role can CTE play in minimizing it?

Studies on the “Skills Gap”

Major consulting firms Deloitte and Accenture have recently released reports whose titles explicitly state their results. From Deloitte, in partnership with The Manufacturing Institute, [Boiling point? The skills gap in U.S. manufacturing](#) reveals that two-thirds of all survey respondents report a “moderate to severe shortage of available, qualified workers,” with the anticipation that this shortage will only get worse. Similarly, Accenture and The Manufacturing Institute have produced an even more recent report entitled [Out of Inventory: Skills Shortage Threatens Growth for US Manufacturing](#), stating that three-quarters of respondents share the same concern: that “there is a moderate to severe shortage of skilled resources” in manufacturing.

On the other hand, a 2014 brief released by the Economic Policy Institute states the opposing case just as adamantly in its report, [Why Claims of Skills Shortages in Manufacturing Are Overblown](#). As evidence, authors explain that less than 17 percent of its sample agreed with the statement that “lack of access to skilled workers is a major obstacle to increasing financial success,” further pointing out that fewer respondents agreed with this statement than with statements suggesting that *weak demand, taxes, or regulation* served as barriers to financial success.

So who are we to believe?

In the face of these and other studies with conflicting conclusions, it is wise to gather plenty of evidence when investigating the reported skills shortage in manufacturing. Things to keep in mind:

- **A survey that reflects the needs of many small firms may report different results than one focused on the needs of large firms.** Smaller firms are likely to face higher per-worker training costs than do larger firms. As a result, hiring workers with skills already in place becomes more of a priority for these smaller companies.
- **The source of any report may influence its overall message.** Reports written in partnership with manufacturing research organizations will have a different bias than those produced independently.
- **Even confirmed trends may look different between the national and local levels.** In other words, what applies to the manufacturing industry country-wide may not be the case for all parts of the Commonwealth.

As a result, CTE Directors examining their own manufacturing programs would do well to ask themselves: What do local data reveal about trends in our area? How large are the companies in our area? What are the specific jobs for which they regularly advertise? How do former students describe their level of preparation?

It is certainly true that with the increased computer reliance in *all* industries, the most competitive applicants will be those with strong problem-solving and critical-thinking skills. In other words, students going into manufacturing, just like students going into STEM or Health Sciences, should be comfortable and confident with the use of technology. But programs such as the [Manufacturing Technology Summer Camps](#) hosted by the Virginia Manufacturers Association’s *Dream it. Do it. Virginia* Network are valuable *not only* for the technology and software exposure they provide, *but also* for the opportunities they give students to work collaboratively. In the face of an increasingly technology-oriented focus in education, it is also important to give appropriate weight to interpersonal or “soft” skills—such as ability to collaborate and cooperate with co-workers.