



Advanced Manufacturing Sector Analysis

Executive Summary

Local Workforce Investment Areas 11 and 12
West Tennessee

Conducted for:
Northwest Tennessee Workforce Board
Dyersburg State Community College

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Definition and Characteristics of Advanced Manufacturing

Advanced Manufacturing is a term that is used loosely to explain any number of methods that take manufacturing operations to another level not easily replicated by competitors. Economists, politicians and manufacturing leaders use the phrase to describe businesses that have processes that will allow them to remain globally competitive.¹

Jobs in the Advanced Manufacturing sector require a complete understanding and mastery of a variety of skill sets. Workers need production skills to set up, operate, monitor and control the manufacturing process. They need process design and development skills to continuously improve production processes. They need skills in health and safety to maintain a safe work environment. They need skills in maintenance, installation and repair to maintain and optimize complex equipment and systems. They need knowledge of supply chain logistics in order to plan and monitor the movement and storage of materials and products. Advanced Manufacturing workers also need skills in quality assurance and continuous improvement to ensure that products and processes meet quality requirements.²

Advanced manufacturing is most commonly associated with the use of high-tech processes such as factory automation, or the development of innovative products. However, advanced manufacturing involves more than new technology. It can encompass new manufacturing technologies that companies in the United States have developed that other countries don't have or it even can be areas where the education level is such that it can't be readily duplicated in Third World countries.³

Advanced manufacturing processes can stem from flexible manufacturing, quality management systems and continuous-improvement principles such as lean manufacturing and Six Sigma. Not all advanced manufacturing applies to next generation products; it can be driven by quality improvements in existing manufacturing processes. This is the primary type of advanced manufacturing processes in operation in West Tennessee.

A flexible manufacturing system is a type of industrial process that allows equipment to be used for more than one purpose, though they may be somewhat related. The equipment is often used to make customized parts, or make different parts for different models of product.⁴

There is some flexible manufacturing present in LWIA11 and LWIA12 according to the employers surveyed for this study. Flexible manufacturing requires workers with the skill to re-program and recalibrate equipment for different manufacturing processes rather than more traditional manufacturing jobs that require workers who act a equipment tenders.

Quality control systems create the largest portion of current demand among West Tennessee companies for workers with advanced manufacturing skills. International Organization for Standards (ISO) Certification and Six Sigma processes were the most commonly reported quality control programs among employers who participated in the survey for this study.

There are levels of ISO certification and the level and type varies among West Tennessee employers. The common requirement among them however, is a need for workers who can make numerical measurements of product quality and process effectiveness.

Six Sigma is a management strategy originally developed by Motorola USA in 1986, based on earlier quality improvement methodologies such as Quality Control, TQM and Zero Defects. ⁵

Identification of Advanced Manufacturing Companies

The process of identifying the advanced manufacturers in LWIA 11 and LWIA 12 began by reviewing a list of 677 companies involved in some type of manufacturing. The West Tennessee Manufacturers list is compiled and maintained by West Tennessee Industrial Association.

The list was narrowed to 73 companies with types of manufacturing processes indicative of advanced manufacturing. Each of these companies was contacted by phone to conduct a phone interview.

After six weeks of contacts and follow-up, 40 companies participated in the study. The companies were interviewed about their manufacturing processes to indicate jobs in demand related to advanced manufacturing and asked to identify any other companies in the area that could be considered advanced manufacturing.

From evaluation of the survey results and a re-examination of the research universe list based upon survey responses, 47 companies were determined to be involved in advanced manufacturing.

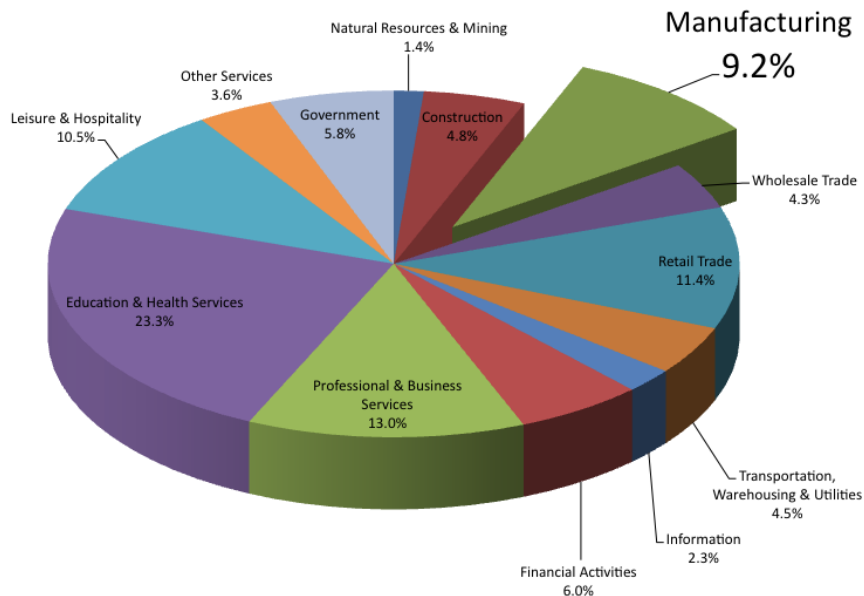
Company	City	Company	City
WINDSOR REPUBLIC DOORS	McKenzie	MARVIN WINDOWS OF TENNESSEE	Ripley
PREMIER MANUFACTURING CORPORATION	Henderson	SRG GLOBAL	Ripley
ASEA BROWN BOVERI (ABB)	Alamo	BLACK & DECKER	Jackson
KOLPAK /MANITOWOC COMPANY	Parsons	BODINE ALUMINUM	Jackson
CATERPILLAR	Dyersburg	DEVILBISS AIR POWER COMPANY	Jackson
COLONIAL DIVERSIFIED POLYMER	Dyersburg	H R & M COMPRESSORS	Jackson
ERMCO	Dyersburg	INTERMET – JACKSON	Jackson
EXCEL POLYMERS	Dyersburg	DEVILBISS	Jackson
NORDYNE	Dyersburg	MILL MASTERS INCORPORATED	Jackson
NSK STEERING SYSTEMS	Dyersburg	PROCTER & GAMBLE	Jackson
POLYONE	Dyersburg	TBDN TENNESSEE COMPANY	Jackson
SRG GLOBAL	Newbern	TENNALUM	Jackson
SUN PRODUCTS/HUISSH DETERGENTS	Dyersburg	UGN, INCORPORATED	Jackson
CECO DOOR PRODUCTS	Milan	US FARATHANE	Jackson
DANA CORPORATION	Humboldt	GENERAL ELECTRIC COMPANY	Selmer
DURA AUTOMOTIVE SYSTEMS	Milan	MASCO BATH CORPORATION	Adamsville
THYSSEN-KRUPP	Middleton	MONOGRAM REFRIGERATION LLC	Selmer
MANUFACTURER'S INDUSTRIAL GROUP	Lexington	KOHLER	Union City
VOLVO-PENTA MARINE PRODUCTS, L.P.	Lexington	LENNOX HEARTH PRODUCTS	Union City
DANA CORPORATION PLUMLEY DIVISION	Paris	WAYMATIC INCORPORATED	South Fulton
PML, INCORPORATED	Paris	THE DELFIELD COMPANY	Covington
SETCO AUTOMOTIVE	Paris	UNILEVER	Covington
TECUMSEH PRODUCTS COMPANY	Paris	PARKER HANNIFIN CORPORATION	Greenfield
U.S. TOOL AND GAUGE INCORPORATED	Paris		

Manufacturing Sector Overview

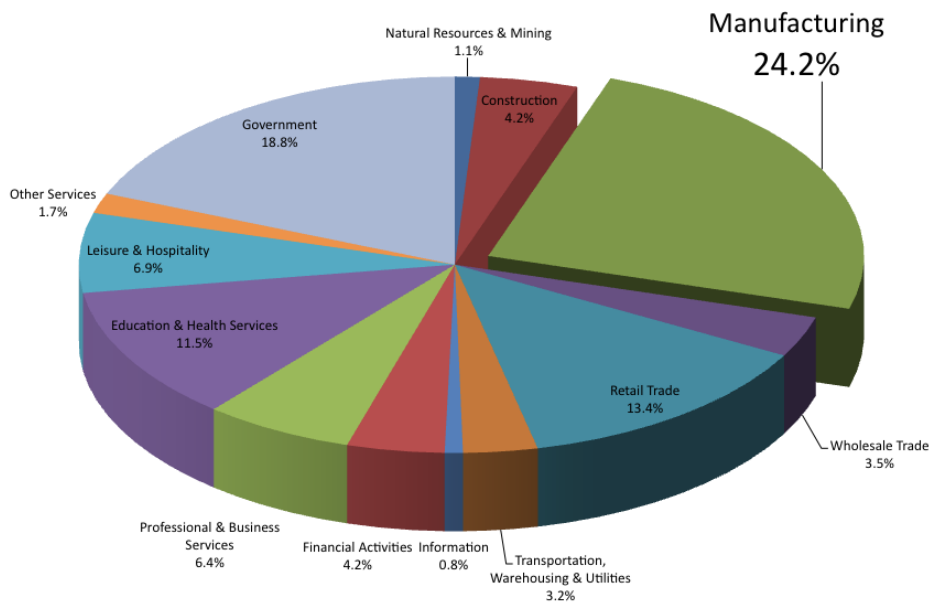
The following charts and graphs depict the concentration of manufacturing in the United States, the state of Tennessee, LWIA 11 and LWIA 12. In 2009, the most recent data available at the time of this study, manufacturing employed 9.2% of the U.S. workforce. In Tennessee, 12.1% of the workforce is employed in manufacturing. In LWIA 11, 18.9% of the workforce is employed in manufacturing and in LWIA 12 that percentage is 24.2%.⁶

It is anticipated that the percentage of manufacturing employment in LWIA 11 and LWIA 12 will decrease over time following the national trend. However, due to the rural nature of the region and the lack of finance and technical firms, manufacturing will continue to employ a larger share of the workforce in LWIA 11 and LWIA 12 than in the state or region.

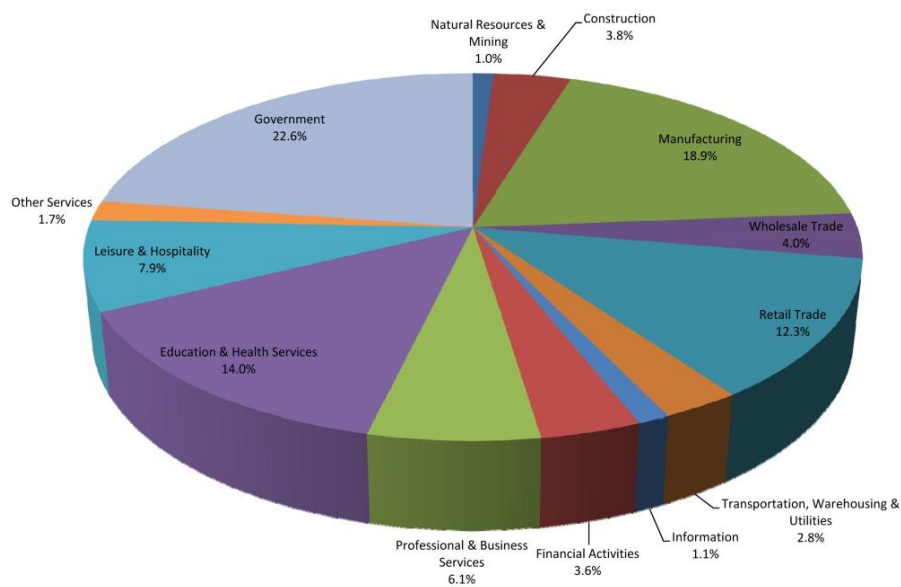
U.S. Distribution of Labor



LWIA 12 Distribution of Labor



LWIA 11 Distribution of Labor



Jobs in Advanced Manufacturing

Based on survey responses from advanced manufacturers, Younger Associates compiled a list of in-demand occupations. “Direct” jobs are those which are actively involved in advanced manufacturing processes. “Indirect” jobs are those that are not directly involved in advanced manufacturing processes, but are required by advanced manufacturing companies in order to operate. The table below lists the direct jobs found to be in-demand for area advanced manufacturers.

Advanced Manufacturing Jobs in Demand – Direct Occupations

Advanced Manufacturing Occupations in Demand	
Computer-Controlled Machine Tool Operators	Industrial Machinery Mechanics
Coil Winders, Tapers, and Finishers	Industrial Production Managers
Drafters, Engineering and Mapping Technicians	Industrial Safety and Health Engineers
Electric Motor, Power Tool, and Related Repairers	Installation, Maintenance, and Repair Occupations
Electrical and Electronics Repairers, Commercial and Industrial Equipment	Machinists
Electrical Engineering Technicians	Maintenance Workers, Machinery
Electrical Engineers	Mechanical Drafters
Electronic Drafter	Mechanical Engineering Technicians
Electronics Engineering Technicians	Mechanical Engineers
Electronics Engineers, Except Computer	Numerical Tool and Process Control Programmers
Engineering Managers	Operations Specialties Managers
First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	Product Safety Engineers
First-Line Supervisors/Managers of Production and Operating Workers	Team Assemblers
Industrial Engineering Technicians	Tool and Die Makers
Industrial Engineers	

Indirect advanced manufacturing jobs are those that are needed by employers to support their advanced operations. Many of these jobs are low-skilled jobs, but create opportunities for valuable on-the-job training and experience that may lead to higher skill-level positions. Other support jobs are in areas such as accounting, which is needed to support the precise cost and inventory control procedures. Recent graduates and displaced workers may not realize that accounting and other professional administration skills are in demand by manufacturers.

Advanced Manufacturing Jobs in Demand – Indirect Occupations

Advanced Manufacturing Occupations in Demand – Indirect Support Jobs	
Accountants	Occupational Health and Safety Specialists and Technicians
Auditors	Packaging and Filling Machine Operators and Tenders
First-Line Supervisors/Manager of Office and Administrative Support Workers	Packers and Packagers, Hand
Helpers--Installation, Maintenance, and Repair Workers	Plant and System Operators
Inspectors, Testers, Sorters, Samplers, and Weighers	Team Assemblers
Machine Feeders and Offbearers	Welding, Soldering and Brazing Machine Setters
Metal Workers and Plastic Workers	Welders, Cutters, Solderers and Brazers

Green Jobs

Where appropriate, occupations related to the burgeoning “green” industrial sector were identified. “Green” jobs refer to those in industries which contribute substantially to preserving or restoring environment quality. Many of these occupations are projected for major growth in coming years, due in part to a national emphasis on the sector’s continuing development. The State of Tennessee has also established special incentives for green industry. Because advanced manufacturing and “green” industry have many similar characteristics, such as waste reduction and increased efficiency, there are many points of intersect between the two.⁷

The next table provides a growth outlook projection for jobs directly and indirectly related to advanced manufacturing through 2016, based on projections from the Tennessee Department of Labor and Workforce Development. This table also shows the percentage of advanced manufacturing jobs in the total employment base. Overall, more than 27% of current jobs are employed in advanced manufacturing or in support occupations for advanced manufacturing in LWIA 11 and LWIA 12. The short term growth projected by West Tennessee employers indicates that the demand for advanced manufacturing jobs is positioned to exceed these long term projections in many cases.

Advanced Manufacturing Employment – Direct and Indirect, 2006 - 2016

LWIA 11 & LWIA 12	Estimated Employment	% of Total Employment	Projected Employment	% of Total Projected Employment	Growth Rate
Advanced Manufacturing	32,544	14%	36,520	14%	96%
Advanced Manufacturing Indirect Jobs	28,830	13%	31,970	13%	83%
Grand Total, Advanced Manufacturing Direct and Indirect Jobs	61,374	27%	68,490	27%	89%

Education and Training for Advanced Manufacturing Jobs

Once advanced manufacturing jobs in demand were identified and analyzed, common skill and knowledge requirements for all occupations were identified. The following lists show the top knowledge clusters and core skills related to advanced manufacturing occupations. Skill as seemingly basic as reading comprehension and active listening were also identified as high-demand skills by survey participants.

Knowledge Clusters
Getting Information
Communicating with Supervisors, Peers or Subordinates
Making Decisions and Solving Problems
Interacting With Computers
Identifying Objects, Actions, and Events
Updating and Using Relevant Knowledge
Evaluating Information to Determine Compliance with Standards

Core Skills
Critical Thinking
Active Listening
Reading Comprehension
Speaking
Coordination
Complex Problem Solving
Repairing

For each occupation, data was compiled from the National Center for Education Statistics and the U. S. Department of Labor, Employment and Training Administration. This information provides an educational pathway for careers, identifying training programs and degree levels of other professionals in that field. The table below offers a sample of the information provided in the full report.

Occupation	Master's Degree or Higher	Bachelor's Degree	Associate's Degree	Some College, No Degree	High School Diploma or Equivalent	Less Than High School Diploma
Coil Winders, Tapers, and Finishers				3%	51%	46%
Computer-Controlled Machine Tool Operators, Metal and Plastic				32%	48%	16%
Electric Motor, Power Tool, and Related Repairers				40%	44%	10%
Electrical and Electronics Repairers, Commercial and Industrial Equipment			39%	39%	21%	
Electrical Engineering Technicians			34%	44%		
Electrical Engineers	10%	73%	13%			

Using these patterns in educational background, degree and certificate programs specific to each occupation were identified and detailed. This information includes program details, costs and time to degree completion. Information is available for 33 training providers in the proximity of LWIA 11 and LWIA 12.

Area Colleges and Technical Schools	
Baptist Memorial College of Health Sciences	Tennessee Technology Center at Jackson
Bethel University	Tennessee Technology Center at McKenzie
Christian Brothers University	Tennessee Technology Center at Memphis
Concorde Career College	Tennessee Technology Center at Newbern
DeVry University-Tennessee	Tennessee Technology Center at Paris
Dyersburg State Community College	Tennessee Technology Center at Ripley
Freed-Hardeman University	Tennessee Technology Center at Whiteville
Jackson State Community College	The University of Tennessee-Martin
Lane College	Union University
Le Moyne-Owen College	University of Memphis
Remington College-Memphis Campus	University of Phoenix
Rhodes College	Vatterott Career College
Southwest Tennessee Community College	Victory University
Strayer University-Tennessee	West Tennessee Business College
Tennessee Technology Center at Covington	William Moore College of Technology
Tennessee Technology Center at Crump	

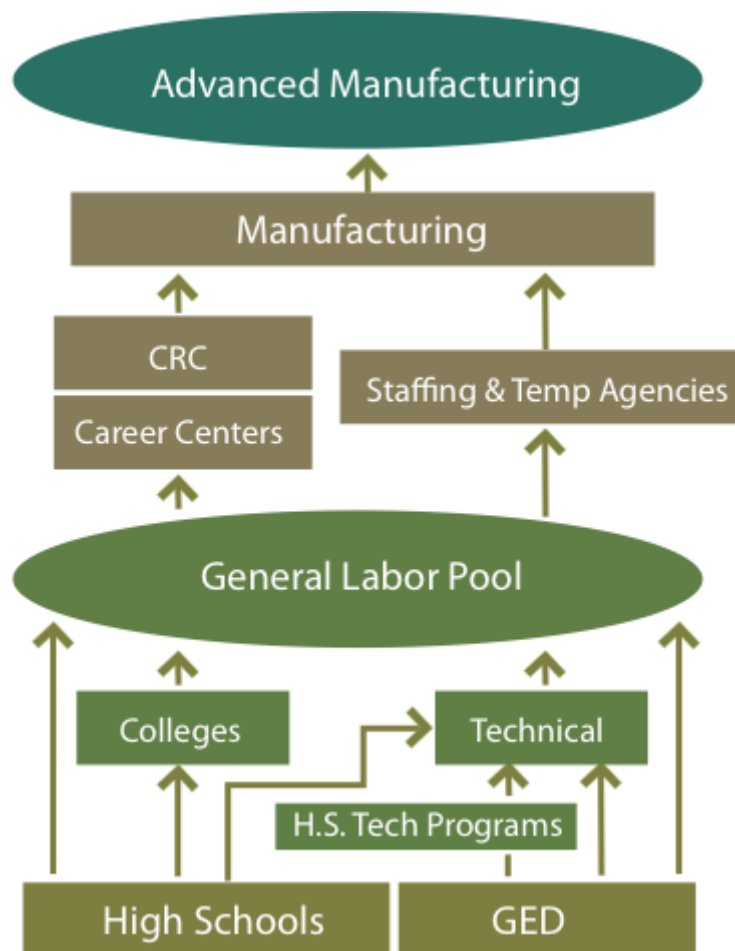
Advanced Manufacturing Career Pathways

The diagram below identifies the multiple steps to highly skilled advanced manufacturing jobs. As the diagram shows, the pathways to advanced manufacturing careers are varied. The guidance to job seekers is that the lower you currently are on the ladder, the lower the chance for reaching a highly skilled advanced manufacturing job. The pathway to success is to take the intermediate steps offered through the many types of training available.

By taking advantage of education and training opportunities a job seeker can work their way up the ladder to an advanced manufacturing job while maximizing the opportunity for employment at each step along the way. Advanced manufacturing employers prefer job candidates who have the education and training to meet the challenges of the job and increasingly require both an education above the high school level and a Career Readiness Certificate (CRC) as evidence that the candidate can be trained for advanced manufacturing processes.

For manufacturing careers, the courses needed from the high school level through post-secondary training have been identified by the National Council for Advanced Manufacturing and the U.S. Department of Education. This information identifies training for each career cluster and may be used by career counselors to advise job seekers.

Advanced Manufacturing Career Pathway Illustration



Notes and Sources

¹Definition of advanced manufacturing from “Advanced Manufacturing: Where is America Today?” White paper by Jonathan Katz published by Industry Week, September 2010

²Skill requirements for advanced manufacturing jobs from National Association of Manufacturers, “2005 Skills Gap Report – A Survey of the American Manufacturing Workforce” and the U.S. Department of Labor Employment and Training Administration

³Definition of advanced manufacturing from “Advanced Manufacturing: Where is America Today?” White paper by Jonathan Katz published by Industry Week, September 2010

⁴Definition of flexible manufacturing from “What is a Flexible Manufacturing System,” article written by Ken Black, copyright by Conjecture Corporation 2003-2011

⁵Definition of six sigma from “Six Sigma: SPC and TQM in Manufacturing and Services,” book by Geoff Tennant, Gower Publishing, 2001.

⁶Source for industry by sector data and for the accompanying charts of distribution of labor: 2009 Quarterly Census of Employment and Wages, Tennessee Department of Labor and Workforce Development, Research and Statistics Division.

⁷Definition of green jobs from “Green Jobs in Manufacturing,” white paper from the National Council for Advanced Manufacturing, December 23, 2008