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# Career Opportunities in Manufacturing

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**Unit:** Career Awareness

**Problem Area:** Career Exploration Site Visits

**Lesson:** Career Opportunities in Manufacturing

- **Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

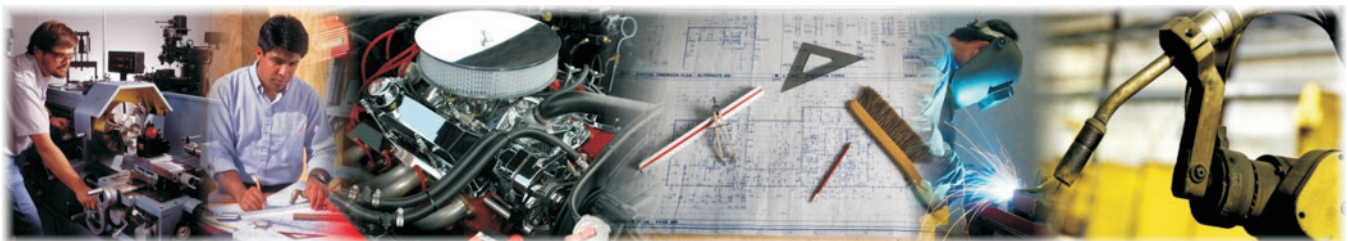
- 1 List career opportunities in manufacturing.**
- 2 Describe career opportunities in manufacturing.**

- **Resources.** The following resources may be useful in teaching this lesson:

“Bureau of Labor Statistics,” *U.S. Department of Labor*. Accessed March 15, 2011. <<http://www.bls.gov/home.htm>>.

“Manufacturing Career Guide,” *Vocational Information Center*. Accessed March 15, 2011. <<http://www.khake.com/page40.html>>.

“Manufacturing Jobs Description,” *E How*. Accessed March 15, 2011. <[http://www.ehow.com/about\\_4688452\\_manufacturing-job-descriptions.html](http://www.ehow.com/about_4688452_manufacturing-job-descriptions.html)>.



## ■ **Equipment, Tools, Supplies, and Facilities**

- ✓ Overhead or PowerPoint projector
- ✓ Visuals from accompanying masters
- ✓ Copies of sample test, lab sheet, and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

## ■ **Key Terms.** The following terms are presented in this lesson (shown in bold italics):

- ▶ CNC programmer
- ▶ chemical equipment controller
- ▶ materials inspector
- ▶ metal fabricator
- ▶ tool and die maker

## ■ **Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations.

*Draw attention to objects in the classroom, and describe the career in manufacturing related to its production and fabrication.*

# CONTENT SUMMARY AND TEACHING STRATEGIES

**Objective 1:** List career opportunities in manufacturing.

**Anticipated Problem:** What career opportunities exist in manufacturing?

- I. Career titles in manufacturing
  - A. Chemical equipment controller or operator
  - B. CNC programmer
  - C. Cutting and slicing machine operator
  - D. Electrical, electronic, or electromechanical equipment installer
  - E. Extruding machine operator
  - F. Fabricator
  - G. Grinding machine set up operator
  - H. Machinist

- I. Materials inspector, handler, sorter, or tester
- J. Metal fabricator (structural metal products)
- K. Mechanical inspector
- L. Plastic molding and casting machine operator
- M. Precision device inspector or operator
- N. Printing machine operator
- O. Printing press machine operator
- P. Production laborers
- Q. System operator
- R. Tool and die maker
- S. Welder
- T. Woodworker
- U. Timing device assembler, adjuster, or calibrator

**Teaching Strategy:** Have the students do individual reports on at least two career opportunities in manufacturing. Use VM–A to enhance discussions on manufacturing jobs.

**Objective 2:** Describe career opportunities in manufacturing.

**Anticipated Problem:** What career opportunities exist in manufacturing?

II. Career opportunities in manufacturing

- A. A **chemical equipment controller** (or operator) is a person who operates equipment to adjust and control chemical changes or reactions for consumer or industrial products. He or she controls the flow of liquid or chemicals with specific equipment.
  1. The equipment varies with the specific task, but it may include reaction kettles, reactor vessels, saturator tanks, batch treating, electrolytic cells, and recovery units.
  2. The job requires knowledge of the processes and equipment used to perform precise chemical reactions. These reactions are controlled by activating material feeds, agitators, pumps, and valves. For some processes, maintaining a specific pressure and temperature is essential. A series of meters, recording instruments, or gauges can be used for monitoring. Some more advanced facilities may have all digital displays on the monitors.
  3. Some jobs may be fairly automatic. The processes are followed and administered through equipment. Others, however, may require mixing chemicals or various agents according to a prescribed formula. A person in this job keeps constant and accurate records of all activities. The particular job tasks may include collecting samples for testing the product, inspecting and cleaning the equipment at specified intervals, and making minor repairs.

4. Required knowledge and skills include chemistry, general math, and science. Mechanical training, including operation and maintenance of tools and equipment, is helpful.
  5. Required education includes on-the-job training and a high school diploma. Vocational and specialty knowledge is preferred.
- B. A **CNC programmer** is a person who controls automatic machining tools (for wood, metal, and plastics) with the use of programs. The programs control the machines with electronic numeric data generated by computers. This requires understanding appropriate software to prepare the geometric data for processing by the equipment and checking all data with specifications in drawings.
1. Job tasks include reading engineering drawings and blueprints and creating sketches of parts to plan tooling or cutting paths.
  2. This person is required to establish the correct type, size, and location of cutting tools. He or she must determine starting points and, if necessary, any change points.
  3. In some cases, basic math and geometry calculations are required.
  4. The CNC programmer is responsible for ensuring that the equipment is working properly. He or she also performs inspections and provides minor maintenance as required.
  5. Required knowledge and skills include computer programming language or software, algebra, and geometry. This person should be able to organize and comprehend written material.
  6. Required education includes on-the-job training, an equipment or program certificate, and an associate degree. A four-year degree may be helpful. In addition, vocational or postsecondary programs related to robotics and automatic computer-controlled machines make a person more marketable.
- C. A **materials inspector** (handler, sorter, or tester) is a person who monitors the quality standard for all manufactured products from food to electronics.
1. Specific job tasks vary across manufacturing types. An employee may inspect materials according to a range of control factors and criteria (e.g., sight and smell) and imperfections (e.g., dents, scratches, or missing parts). He or she needs to verify that the material meets exact specifications or characteristics required for the final product, and this involves being involved throughout all stages of manufacturing.
  2. Some jobs require knowledge of machinery that is used to inspect or sort the product. Other jobs might just require a quick visual inspection.
  3. A range of tools can be used on the material and devices for various tests. For example, electronic equipment requires ammeters and voltmeters. This equipment is tested and checked to make sure it is working properly. Today, a lot of the inspection is handled electronically.
  4. A material inspector or handler may perform a series of tests on products and materials to ensure that they perform as desired and last as long as they are guaranteed.

5. Required knowledge and skills include math and mechanical aptitude as well as reading comprehension of manuals and specifications. Specific skills and knowledge vary depending on the material and manufactured product.
  6. The specific educational and training experience will vary depending on the field. For basic material inspection and handling, a high school diploma is usually sufficient. For more advanced tasks, postsecondary and additional vocational studies are helpful. This may include specialized instrument training. Also, certificates are available for different tasks, depending on the job.
- D. A **metal fabricator** is a person who assembles and fabricates metal products. This may include the framework for machinery or assembly systems and structural members for engineering and architectural jobs.
1. The job requires sequencing the fabrication process of the metal product and understanding how a metal workpiece can be cut, bent, or welded to create specific forms. Various machines may be used, including jigs, drill presses, flame cutters, welding torches, brakes, rolls, shears, and precision instruments for measurement.
  2. Some fabricating processes are performed by hand, while others may require machining operations.
  3. Knowledge and skill required include mechanical, building and construction, engineering technology, and design. Also required is an understanding of production processes and material properties.
  4. Math (e.g., trigonometry) and equipment analysis, monitoring, and control are necessary skills for a metal fabricator.
  5. The job requires a high school diploma and on-the-job training. The specifics of certain jobs may require additional classroom instruction, an associate degree, or specialized training.
- E. A **tool and die maker** is a person who operates conventional and computer numerically controlled machine production tools, dies, jigs, gauges, and special guiding and holding devices. He or she also repairs existing devices. These devices are required by other machines to perform their specific function. Examples are producing parts and equipment for automobiles, aircraft, and textile equipment.
1. Large manufacturing facilities may have their own in-house tool and die makers, or they may work at a specialized machine shop.
  2. An important skill is analyzing blueprints and plans to lay out metal stock that will be cut and trimmed into specific shapes as well as setting up the series of operations that will be needed to produce the final piece.
  3. The tool and die maker uses machine tools and hand tools to adjust, file, grind, modify, and assemble parts.
  4. A tool and die maker operates conventional and computer numerically controlled machine tools (e.g., grinders, lathes, milling machines, and drill presses) to cut, bore, and grind working stock.
  5. A tool and die maker uses precision instruments (e.g., micrometers, calipers, and scribes) to verify dimensions and tolerances. He or she also has knowledge of metal properties and procedures to achieve the desired finish of the product.

6. Required skills and knowledge include mechanical, production and processing, equipment operation, control, and selection.
7. Required education and training is usually four to five years in the classroom and on-the-job training in a formal apprenticeship. Some apprentices work and attend technical or community college at the same time. Recommended courses are computers, mathematics, and tool programming and designing.

**Teaching Strategy:** Have a guest presentation from an employer of a local manufacturing facility. Assign LS–A.

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the Review/Summary.
- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.
- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

## ■ **Answers to Sample Test:**

### **Part One: Completion**

1. materials inspector
2. chemical reactions
3. programs
4. material properties
5. high school diploma
6. CNC programmer

### **Part Two: True/False**

1. F
2. T
3. T
4. T
5. F
6. T

### **Part Three: Short Answer**

Answers will vary. See “Content Summary”: II.B.6.7.



# Career Opportunities in Manufacturing

## ► Part One: Completion

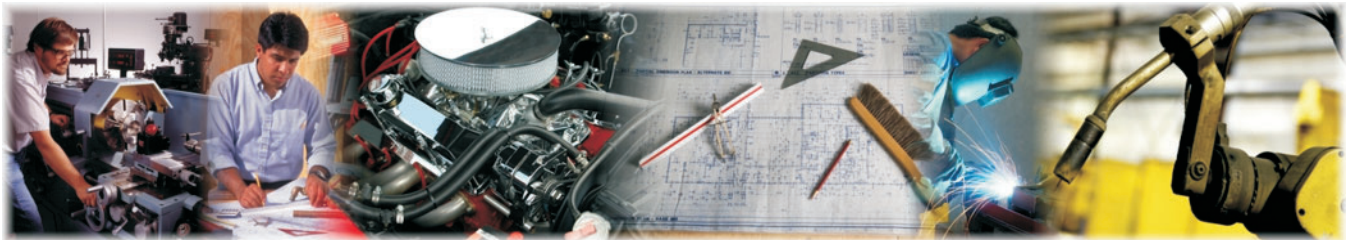
**Instructions:** Provide the word or words to complete the following statements.

1. A/an \_\_\_\_\_ monitors the quality standard for all manufactured products from food to electronics.
2. A chemical equipment controller requires knowledge of the processes and equipment used to perform precise \_\_\_\_\_.
3. A CNC programmer controls automatic machining tools for wood, metal, and plastics with \_\_\_\_\_.
4. A metal fabricator requires understanding of production processes and \_\_\_\_\_.
5. For basic material inspection and handling, a/an \_\_\_\_\_ is usually sufficient.
6. A/an \_\_\_\_\_ controls automatic machining tools for wood, metal, and plastics with the use of programs.

## ► Part Two: True/False

**Instructions:** Write *T* for true or *F* for false.

- \_\_\_\_ 1. CNC programmers are not responsible for ensuring that the equipment is working properly.
- \_\_\_\_ 2. Tool and die makers are required to analyze blueprints and plans.



- \_\_\_\_\_ 3. A chemical equipment controller works with reactions that are controlled by activating material feeds, agitators, pumps, and valves.
- \_\_\_\_\_ 4. Material inspectors or handlers may perform a series of tests on products and materials.
- \_\_\_\_\_ 5. Metal fabricators do not need knowledge of math, such as trigonometry.
- \_\_\_\_\_ 6. Die and tool makers operate conventional and computer numerically controlled machines.

► **Part Three: Short Answer**

**Instructions: Answer the following.**

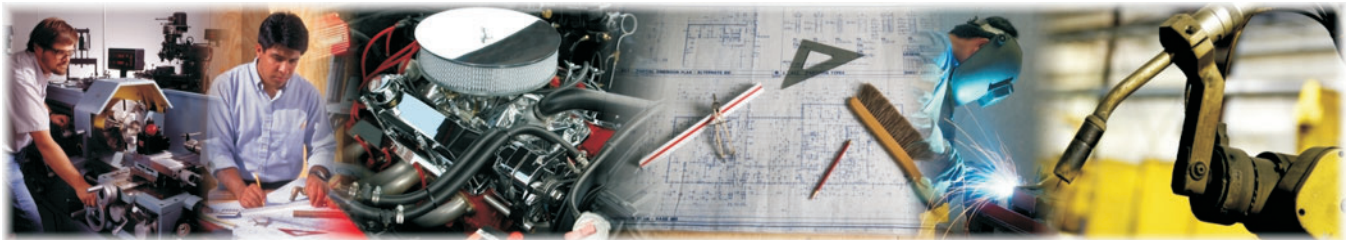
What are the required skills for a CNC programmer?



# MANUFACTURING JOBS

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- ◆ Chemical equipment controller or operator
- ◆ CNC programmer
- ◆ Cutting and slicing machine operator
- ◆ Electrical, electronic, or electromechanical equipment installer
- ◆ Extruding machine operator
- ◆ Fabricator
- ◆ Grinding machine set up operator
- ◆ Machinist
- ◆ Materials inspector, handler, sorter, or tester
- ◆ Metal fabricator (structural metal products)
- ◆ Mechanical inspector



- ◆ Plastic molding and casting machine operator
- ◆ Precision device inspector or operator
- ◆ Printing machine operator
- ◆ Printing press machine operator
- ◆ Production laborers
- ◆ System operator
- ◆ Tool and die maker
- ◆ Welder
- ◆ Woodworker
- ◆ Timing device assembler, adjuster, or calibrator

# Learning about Career Opportunities in Manufacturing

## Purpose

The purpose of this activity is to explore career opportunities in manufacturing.

## Objective

Research careers in manufacturing.

## Materials

- ◆ lab sheet
- ◆ writing utensil
- ◆ paper
- ◆ computer and Internet access

## Procedure

1. Select at least two career opportunities in manufacturing discussed in class.
2. Go the U.S. government's website listed on your E-unit, or visit the "career planner" website.
3. Once there, enter the career titles you selected.
4. Then create a list that includes what the job entails (work activities) and what knowledge and skills are required.
5. Present your findings to the rest of the class.

