LEARNING OBJECTIVES
After studying this chapter, students will be able to:
- Identify the various types of sawing and cutoff machines.
- Select the correct machine for the job to be done.
- Mount a blade and prepare the machine for use.
- Position the work for the most efficient cutting.
- Safely operate sawing and cutoff machines.

INSTRUCTIONAL MATERIALS
Text: pages 191–200
  Test Your Knowledge Questions, page 199
Workbook: pages 65–68
Instructor’s Resource: pages 161–170
  Guide for Lesson Planning
  Research and Development Ideas
Reproducible Masters:
  12-1 Cutoff Saws
  12-2 Cutting Pressure
  12-3 Tooth Set and Tooth Shape
  12-4 Reverse Work after Replacing Blade
  12-5 Holding Work for Sawing
  12-6 Test Your Knowledge Questions
Color Transparencies (Binder/CD only)

GUIDE FOR LESSON PLANNING
Have students read and study the chapter. Reproducible Masters can be used on the overhead projector or copied and distributed to the class. Review the assignment and discuss the following:
- Types of power saws and how they operate.
- Proper way to mount, position, and cut material.
- How to select the proper blade.
- How to mount and tension blades.
- How to adjust machine for most efficient cutting.
- Causes and corrections for sawing problems.
- Safety precautions to be observed when power sawing.

When demonstrating power saw operations be sure all students can hear and observe what you are doing. Approved eye protection must be worn by all students/trainees.

Briefly review the demonstrations. Provide students/trainees the opportunity to ask questions.

Technical Terms
Review the terms introduced in the chapter. New terms can be assigned as a quiz, homework, or extra credit. The following list is also given at the beginning of the chapter.
- all-hard blade
- cold circular saw
- dry abrasive cutting
- flexible-back blades
friction saw
golden feed
horizontal band saw
raker set
three-tooth rule
wet abrasive cutting

Review Questions
Assign Test Your Knowledge questions. Copy and distribute Reproducible Master 12-6 or have students use the questions on page 199 and write their answers on a separate sheet of paper.

Workbook Assignment
Assign Chapter 12 of the Machining Fundamentals Workbook.

Research and Development
Discuss the following topics in class or have students complete projects on their own.
1. Make a display panel that includes samples of the different band saw blades used by industry. Label them according to their recommended use. Provide a magnifying glass so the blade teeth can be examined in detail.
2. Secure samples of abrasive cutoff wheels and of the material they are best suited to cut. Prepare a bulletin board display using these wheels and samples, and manufacturers’ brochures of abrasive cutoff machines.
3. Prepare large scale models of the following blade types from suitable aluminum sheet: raker and wavy set teeth, standard tooth blade, skip tooth blade, and hook tooth blade. Mount them in hardwood stands for easy examination.
4. Design and produce a series of safety panels pertaining to power sawing.
5. If the power saw in your shop has seen extensive service, use the machine’s service manual to overhaul the machine. If needed, contact the manufacturer for a service manual and parts list. If time permits, paint the machine according to “color dynamics” specifications.
6. Demonstrate the various methods used to properly tension a blade on a power saw.
7. Contact a saw blade manufacturer and request a chart showing the best type blade for various sawing situations. Mount it near the saw so it is readily accessible.

TEST YOUR KNOWLEDGE
ANSWERS, Page 199
1. Reciprocating, continuous band-type, and circular-type.
2. Reciprocating, back
3. A minimum of three teeth must be cutting at all times.
4. Cast iron, and soft brass
5. Flexible iron, and all-hard.
6. a. 4
   b. 6
   c. 10- and 14-
7. Sound of blade when properly tensioned (low musical ring); shape of pin hole (slightly elongated); and using a torque wrench to tighten to manufacturer’s specifications.
8. When several pieces of same length must be cut.
9. Faster speed, greater precision, and less waste.
10. Raker and wavy.
11. a. standard
    b. skip
    c. hook
12. Abrasive cutoff saw, cold circular saw, and friction saw.

WORKBOOK ANSWERS,
Pages 65–68
1. c. definite pressure
2. b. coarse-tooth blades
3. c. Flexible-back
4. A. Raker
   B. Wavy
5. Checking wheel alignment, guide alignment, feed pressure, hydraulic systems.
6. A. Blade dropped on work. Loose blade or excessive speed.
   B. Usually caused by worn blade.
   C. Dirty mounting plates or too much tension on blade.
   D. Insufficient pressure/excessive pressure. Lack of coolant or poorly adjusted machine.
   E. Starting cut on sharp corner. Less than three teeth cutting, blade too fine or too coarse.
7. Wet, Dry
8. accurate, sever
9. billets
10. Evaluate individually.
Cutoff Saws

Cutoff Saws

Lifts slightly on forward noncutting stroke

Circular Type Saw

Abrasive cutoff wheel, circular toothed blade, or circular no tooth blade (friction cutting)

Reciprocating Type Power Saw

Cuts only on this side

Band Type Power Saw

Continuous cutting

Continuous cutting

Circular Type Saw

Abrasive cutoff wheel, circular toothed blade, or circular no tooth blade (friction cutting)
Cutting Pressure

Apply heavy feed pressure on hard metals and large work. Use light pressure on soft metals and work with small cross sections.
Tooth Set and Tooth Shape

Raker

Wavey

Saw blades commonly have raker or wavy teeth. Raker teeth are preferred for general use, cutting large solid sections, and cutting thick plate.

Standard tooth blades, with rounded gullets, are usually best for most ferrous metals, hard bronzes, and hard brasses.

Skip tooth blades provide for more chip clearance without weakening the blade body. They are recommended for cutting aluminum, magnesium, copper, and soft brasses.

Hook tooth blades offer two advantages over skip tooth blades—easier feeding and less “gumming up.”
Reverse Work after Replacing Blade

Partial cut made by worn blade

Rotate work to start new cut with new blade

Cut with worn blade

Never attempt to start a new blade in a cut made by a worn blade. Reverse the work and start another cut on the opposite side. Cut through to the old cut.
Holding Work for Sawing

Correct

Incorrect

Recommended ways to hold sharp-cornered work for cutting. A carefully planned setup will ensure that at least three teeth will be cutting, greatly extending blade life.
Sawing and Cutoff Machines

1. List the three basic types of metal-cutting saws.

2. The _____ type saw has a back-and-forth cutting action. However, it only cuts on the _____ stroke.

3. What is the “three-tooth rule” for sawing?

4. When using a power sawing machine, with which materials should you not use coolant?

5. Hacksaw blades are manufactured in two principal types. Name them.

6. The following “rule-of-thumb” should be followed for selecting the correct blade:
   a. _____ teeth per inch for cutting large sections or readily machined materials.
   b. _____ teeth per inch for cutting harder alloys and miscellaneous cutting.
   c. _____ teeth per inch for cutting on the majority of light-duty machines, where work is limited to small sections and moderate to light feed pressures.

7. List three methods used to put proper tension on a power hacksaw blade.

8. When is a stop gage used?
9. What three advantages does the continuous band sawing machine offer over other types of power saws?

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10. Band saw blades are made with two types of teeth. Name them.

11. The tooth pattern of a blade determines the efficiency of a blade in various materials.
   a. The _____ tooth is best suited for cutting most ferrous metals.
   b. The _____ tooth pattern is preferred for cutting aluminum, magnesium, copper, and soft brass.
   c. The _____ tooth is also recommended for most nonferrous metallic materials.

12. List the three types of circular metal-cutting saws.

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13. List five safety precautions to be observed when operating a power saw.

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