

UNIT 4

Saws and Cutoff Machines

Learning Objectives

After completing this unit, the student should be able to:

- Identify the various sawing machines used in the machine shop
- Operate band saws safely
- List the different band saw blade materials
- Define blade pitch
- Identify the three different tooth patterns and their uses
- Identify the three different blade sets and their uses
- Describe how to select proper band saw blade width
- Understand and be able to identify saw tooth geometry
- Explain the term kerf
- Calculate band saw blade length
- Describe the band welding procedure
- Describe blade mounting procedure for the vertical band saw

Key Terms

Alternate set

Bimetal

Carbide tooth

Carbon steel

Gauge

Gullet

High-Speed Steel (HSS)

Hook tooth form

Horizontal band saw

Kerf

Pitch

Power hacksaw

Rake

Raker set

Regular tooth form

Skip tooth form

Tooth form

Tooth set

Teeth Per Inch (TPI)

Variable-pitch blade

Vertical band saw

Wavy set

INTRODUCTION

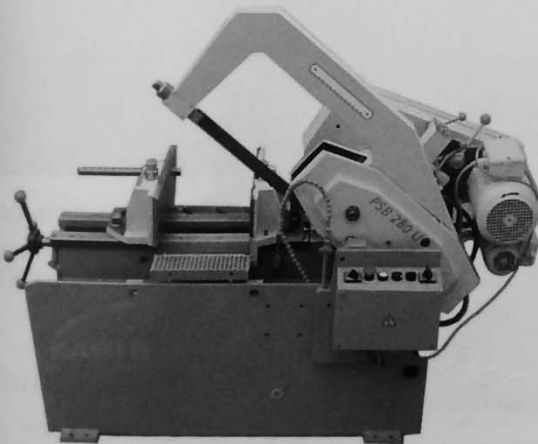
One of the first operations performed in most machining processes is to saw raw material for a workpiece from bar, tube, or sheet material called *stock*. There are four common types of sawing machines: the power hacksaw, the band saw, the abrasive cutoff saw, and the cold saw. Each has distinct uses in the shop.

POWER HACKSAWS

The **power hacksaw** operates on the same principle as the hand hacksaw. Cutting action is achieved by drawing a saw blade back and forth across a workpiece. The power hacksaw shown in **Figure 3.4.1** is the earliest sawing machine we will mention and has been used for many years to cut off raw materials such as bar stock, plate, and pipe. To use the power hacksaw, the operator sets up the machine to achieve the number of blade strokes per minute for the material being cut. Cutting action on this type of saw occurs only on the forward stroke, making it very inefficient. For that reason, the power hacksaw has been largely replaced by newer band-style machines. However, the power hacksaw is still useful in some applications.

BAND SAWING MACHINES

Band sawing machines are the most commonly encountered saws. The blade is a continuous metal band with a series of teeth ground into one edge. Two large wheels are located at opposite ends of the saw that both support and drive the saw blade. When the power is turned on, the drive wheels begin to rotate, causing the saw blade to move. The continuous blade cuts constantly, which reduces sawing time. Blades on band



Courtesy of Kasto, Inc.

FIGURE 3.4.1 A power hacksaw only cuts in one direction.

saws cut more accurately than reciprocating hacksaws and build up less heat.

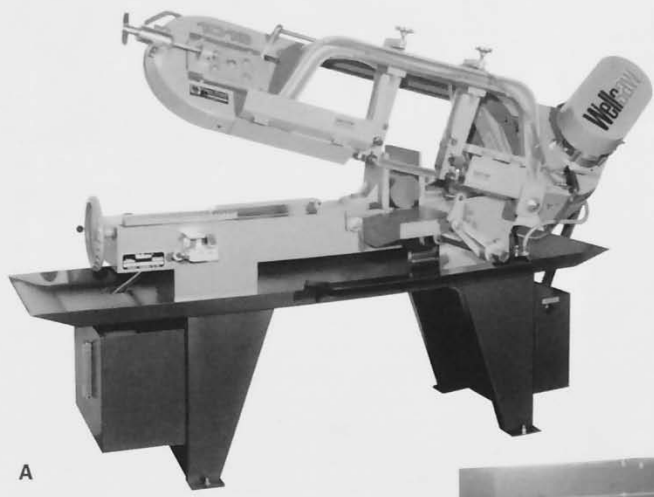
Horizontal Band Saws

The **horizontal band saw** gets its name from the fact that the blade is in a horizontal orientation. It is capable of cutting off large pieces of stock both quickly and accurately, holding tolerances to + or - 0.015 of an inch or better. This makes the horizontal band saw ideal for producing straight cuts through raw material. Most horizontal band saws use a vise to clamp material being cut. Most also incorporate a coolant system that floods the area where the cutting action is occurring with cutting fluid to help cool both the workpiece and the saw blade. Many modern horizontal band saws are equipped with power feeds that are controlled either hydraulically or by means of computer numerical control (CNC). **Figure 3.4.2** shows examples of manual, hydraulic, and CNC horizontal band saws.

Horizontal Band Saw Basic Operation

Here are some basic steps to follow when using a horizontal band saw to cut material. Keep in mind that because of the many different models, each machine will have its own specific controls.

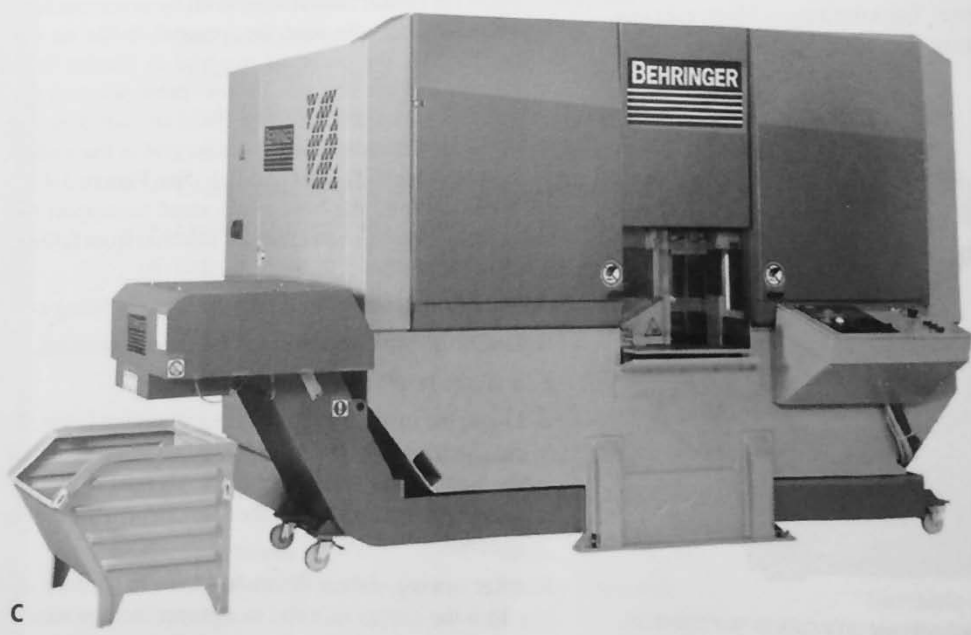
1. Adjust the arms that guide the blade as close together as possible for the size of the material being cut and lock them in place. (See **Figure 3.4.3**.)
2. Measure the desired length and mount the material solidly in the saw's vise. Stock is normally cut about 1/16–1/8" longer than finished part requirements to allow for further material removal by other machining operations. Be sure the material is flat on the machine. If the piece of material is shorter than the width of the vise jaw, the moveable jaw may rotate and not hold it securely. Place another piece of the same size material near the far end of the vise to keep the clamping jaws parallel. (See **Figure 3.4.4**.) When cutting long bars, use a stand to support the stock to keep it flat and prevent material from falling. (See **Figure 3.4.5**.)
3. Set the proper band speed for the material being cut.
4. Lower the blade within about 1/4" of the material.
5. Start the band.
6. Lower the blade slowly into the material to begin the cut. Starting the cut too quickly can break teeth off the blade. Once several teeth are engaged in cutting, set an appropriate rate for the blade to cut through the material.
7. After sawing, deburr the material, clean the saw, and return the excess material to a proper storage area.



Courtesy of Wellsaw, Inc.



Copyright © 2015, Cengage Learning



Courtesy of Behringer Saws, Inc.

FIGURE 3.4.2 (A) A manual horizontal band saw, (B) a hydraulic horizontal band saw, and (C) a CNC horizontal band saw.

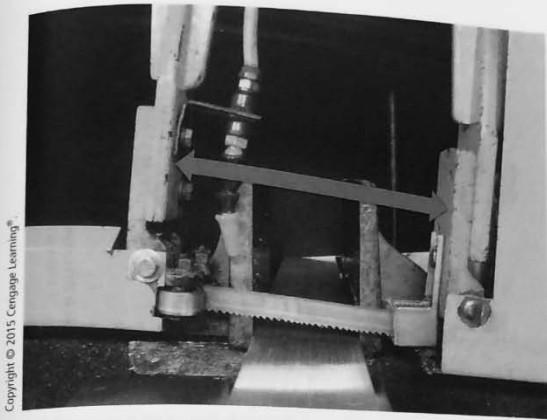


FIGURE 3.4.3 Adjust the guide arms of a horizontal band saw as close as possible for the material being cut. This helps to keep the blade straight and results in straighter cuts.



FIGURE 3.4.5 Use a stand to support long bars being cut on the horizontal band saw. This keeps them flat and prevents them from falling when the vise is unclamped.



FIGURE 3.4.4 When clamping short sections in the saw vise, use another piece of the same size material to keep the moveable jaw parallel to the solid jaw to ensure adequate clamping.

moving machine parts. When moving long or heavy bars of material, get help to avoid injury, and always use proper lifting techniques. Always lock out or tag out the machine's power when adjusting guides, changing blades, or performing any machine maintenance.

Horizontal Band Saw Safety

As with any machine tool, observing a few safety guidelines will keep everyone safe and prevent damage to equipment. Never attempt to hold material by hand when using a horizontal band saw, and keep all body parts clear of the moving saw blade and any other