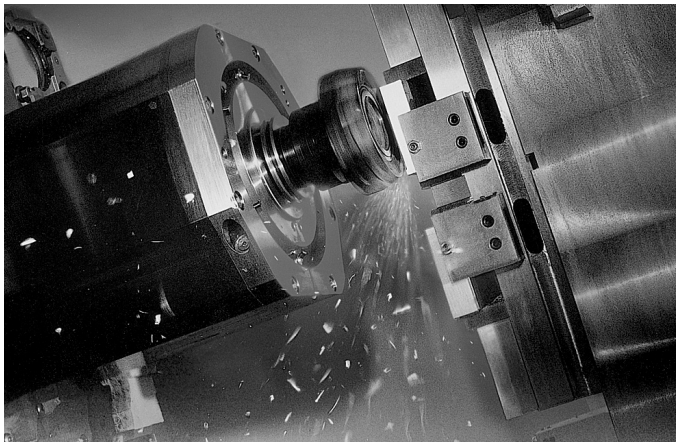


Chapter 20

Band Machining

LEARNING OBJECTIVES

After studying this chapter, students will be able to:

- ❍ Describe how a band machine operates.
- ❍ Explain the advantages of band machining.
- ❍ Select the proper blade for the job to be done.
- ❍ Weld a blade and mount it on a band machine.
- ❍ Safely operate a band machine.

INSTRUCTIONAL MATERIALS

Text: pages 383–398
Test Your Knowledge Questions, pages 397–398
Workbook: pages 113–116
Instructor's Resource: pages 269–278
Guide for Lesson Planning
Research and Development Ideas
Reproducible Masters:
20-1 Band Machining Operation
20-2 Band Machining Advantages
20-3 Blade Recommendations
20-4 Cutting Recommendations
20-5 Test Your Knowledge Questions
Color Transparencies (Binder/CD only)

GUIDE FOR LESSON PLANNING

Prepare the following for examination and demonstration purposes:

- Set up a band machine for operation.
- A selection of blade types (different widths, sets, and tooth forms).
- A properly welded blade.
- Welded blade sections illustrating different welding problems.
- A sampling of the type of work that can be done by band machining.

Have the class read and study the chapter. Using the various reproducible masters as overhead transparencies and/or handouts, review the assignment. Discuss and demonstrate the following:

- A description of band machining and the band machine.
- The advantages offered by band machining.
- How to select the blade to match the job.
- How to prepare and weld a blade.
- Problems that might occur when welding blades and how to correct them.
- Preparing a band machine for operation.
- Determining and setting the proper cutting speed.
- Straight sawing.
- Contour sawing.
- Making angular and internal cuts.
- Using power feed.
- Other band machining applications.
- Band machining problems and how to correct them.
- Safety precautions to be observed when band machining.

A brief review of the demonstrations will 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.

blade guide inserts
diamond-edge band
file band
internal cuts
knife-edge blade
mist coolant
raker set
straight set
tooth form
wavy set

Review Questions

Assign *Test Your Knowledge* questions. Copy and distribute Reproducible Master 20-5 or have students use the questions on pages 397–398 and write their answers on a separate sheet of paper.

Workbook Assignment

Assign Chapter 20 of the ***Machining Fundamentals Workbook.***

Research and Development

Discuss the following topics in class or have students complete projects on their own.

1. Overhaul a worn band machine in your training area. Follow procedures outlined by your instructor.
2. Collect literature on the various types of vertical band machines. Bind and catalog the collection for a technical library.
3. Secure samples of the various types of blades used on band machines. Mount and label them on a suitable display panel.
4. Visit a local industry that uses band machines. Note the type of work being done. Obtain permission to talk with machine operators to find out what their reactions are to operating a band machine. What type work is the most difficult to perform on the machine?
5. Secure a movie or video on band machining. Prepare a list of items to be discussed with the class after viewing the tape or film.
6. Demonstrate the proper way to weld a band saw blade.
7. Prepare a paper on the history of band machining.
8. Borrow samples of work produced on a band machine. Develop a display around them and explain how they were made.

TEST YOUR KNOWLEDGE ANSWERS, Pages 397–398

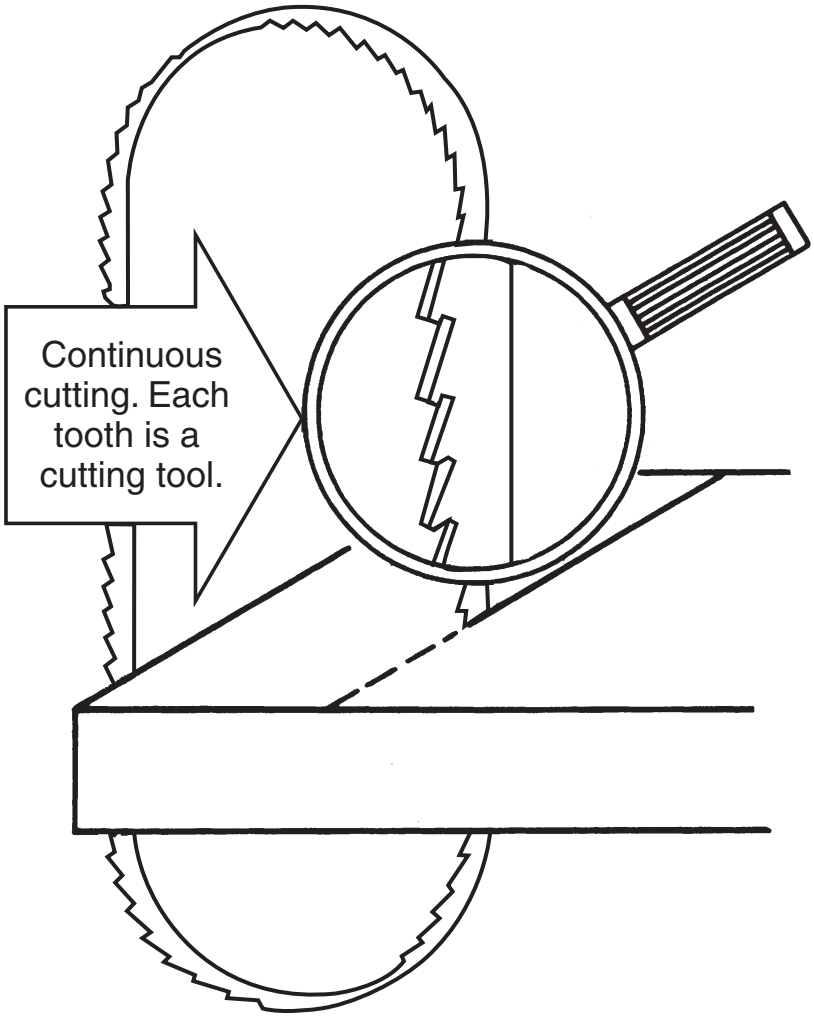
1. continuous saw
2. downward
3. Student answers will vary but may include three of the following: maintains sharpness; is very efficient; provides unrestricted cutting geometry; provides a built-in work-holder.
4. Blade type and blade characteristics.
5. c. Number of teeth per inch of blade or tooth spacing in millimeters.
6. a. Shape of the tooth.
7. widest
8. strong
9. annealed, brittle
10. resistant type butt
11. b. Keep it taut and tracking properly.
12. a. Flooding
    b. Mist coolant
    c. Solid lubricants
13. Straight two-dimensional cutting
14. angular
15. Threading blade through a hole drilled in piece. Weld blade and make cut.
16. band filing
17. A band machining technique that makes use of extremely high cutting speeds and heavy pressure.
18. This blade makes it possible to cut material that would tear or fray if cut with a conventional blade.
19. They are designed to cut material that is difficult or impossible to cut with a conventional toothed blade.
20. It can cut in any direction.

WORKBOOK ANSWERS, Pages 113–116

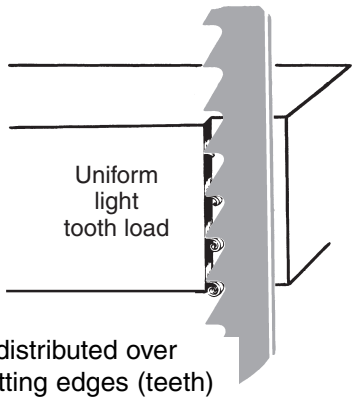
1. It uses a continuous saw blade for rapid chip removal. Each tooth is a precision cutting tool.
2. Wear leather gloves and approved eye protection.

3. c. cutting large solids
4. gage
5. b. the widest blade that will cut the desired curves
6. To assure uniform spacing after the weld is made.
7. To reduce the possibility of missing a vital point.
8. b. Roller guides
9. crown
10. By the width and pitch of the blade.
11. abrasive cloth
12. d. All of the above.
13. Any two of the following: reduce feed pressure; use finer pitch band if thin material is being cut; be sure work is held solidly as it is being fed into band; use a heavier-duty cutting fluid.
14. d. All of the above.
15. Any two of the following: remove burr on back of band where joined; if hunting back and forth against backup bearing on guide, reweld blade with back of band in true alignment; check alignment of wheels; check backup bearing, replace if worn.
16. Any of the following: use a slower cutting speed; replace the blade with a finer pitch band; be sure proper cutting fluid is used; increase feed pressure; check if band is installed with teeth pointing down.
17. Any of the following: change to a heavier band; reduce cutting speed; check wheels for damage; if blade breaks at weld, use longer annealing time; reduce heat gradually; use finer pitch blade; reduce feed pressure.
18. low
19. guides
20. A. Back
    B. Body
    C. Width
    D. Gullet depth
    E. Tooth rake angle
    F. Tooth clearance angle
    G. Tooth spacing
    H. Tooth face

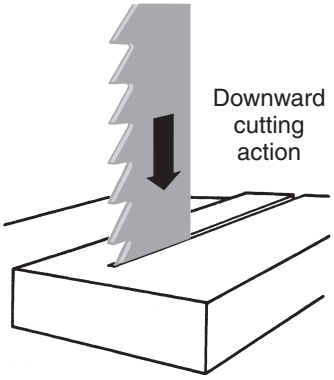
Band Machining Operation



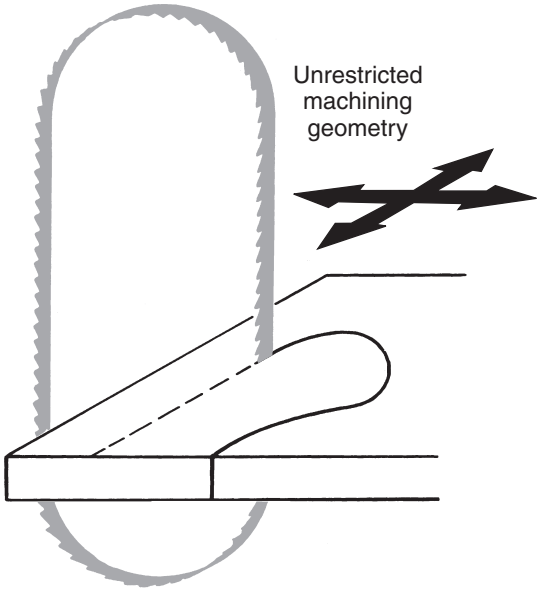
Band Machining Advantages



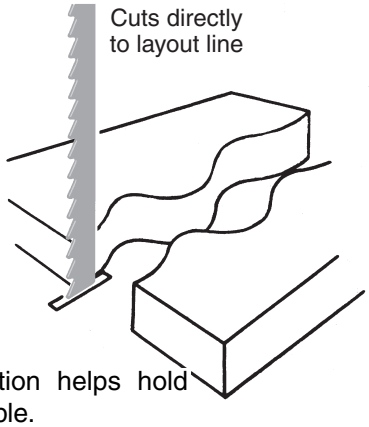
Wear is distributed over many cutting edges (teeth)



Band machining is very efficient and produces little waste. Unwanted material is removed in solid sections.



Band machining permits machining at any angle or direction. Cut length is almost unlimited.



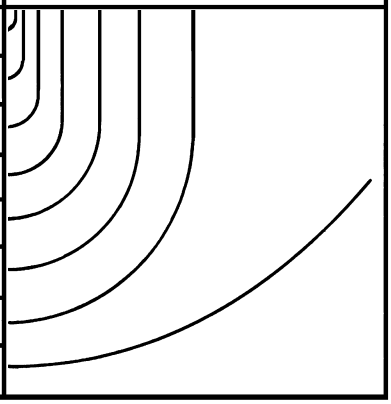
Cutting action helps hold work on table.

Blade Recommendations

Type of blade	Applications	Band machine
T/C Inserted tungsten carbide teeth on fatigue-resistant blade.	Heavy production and slabbing operations in tough materials.	Horizontal cutoff machines over 5 hp with positive feed. Vertical contour machines over 5 hp with positive feed.
Imperial bimetal HSS cutting edge with flex-resistant carbon-alloy back.	Mild to tough production and cutoff applications.	Horizontal cutoff machines over 1 1/2 hp with controlled feed, generally with variable-speed drives and with coolant system. Vertical contour machines over 1 1/2 hp with coolant system.
Demon M–2 HSS blade.	Heavy-duty toolroom and maintenance shop work. Full-time production applications.	Horizontal cutoff machines over 1 1/2 hp with controlled feed, generally with variable-speed drives and with coolant system. Vertical contour machines over 1 1/2 hp with coolant system.
Demon shock-resistant M–2 HSS blade specially processed for greater shock resistance.	Structurals, tubing, materials of varying cross section.	Horizontal cutoff machines over 1 1/2 hp with controlled feed, generally with variable-speed drives and with coolant system. Vertical contour machines with 1 1/2 hp with coolant system.
Dart Carbon-alloy, hard-edge, spring-tempered back blade.	Superior accuracy for light toolroom and maintenance shop applications as well as light manufacturing.	Horizontal cutoff machines under 1 1/2 hp with coolant system. Vertical contour machines under 1 1/2 hp with coolant system.
Standard carbon All-purpose, hard-edge, flexible back blade.	Light toolroom and maintenance shop applications.	Horizontal cutoff machines under 1 1/2 hp with weight feed and without coolant. Generally step speeds. Vertical contour machines under 1 1/2 hp without coolant.

Blade width is from tooth tip to other edge or back.

WIDTH OF BLADE	SMALLEST RADIUS
1/16	1/16
3/32	1/8
1/8	7/32
3/16	3/8
1/4	5/8
5/16	7/8
3/8	1 1/4
1/2	3



Cutting Recommendations

Material thickness	Band pitch
Less than 1″ (25 mm)	10 or 14
1 to 3″ (25 to 75 mm)	6 or 8
3 to 6″ (75 to 150 mm)	4 to 6
6 to 12″ (150 to 300 mm)	2 or 3

Recommended band pitches to saw various thicknesses of material.

Material	Thickness Inches (millimeters)	Band speed Surface feet per minute (meters per minute)
Low-to-medium carbon steels	Under 1″ (25 mm)	345–360 sfm (105–110) mpm
	1″–6″ (25 mm–150 mm)	295–345 sfm (90–105) mpm
Medium-to-high carbon steels	Under 1″ (25 mm)	225–250 sfm (70–75) mpm
	1″–6″ (25 mm–150 mm)	200–225 sfm (60–70) mpm
Free machining steels	Under 1″ (25 mm)	260–395 sfm (80–120) mpm
	1″–6″ (25 mm–150 mm)	260–345 sfm (80–105) mpm
Titanium, pure and alloys	Under 1″ (25 mm)	100–115 sfm (30–35) mpm
	1″–6″ (25 mm–150 mm)	90–110 sfm (30–35) mpm

Recommended cutting speeds for selected metals and alloys.

Band Machining

Name: _____Date: _____ Score: _____

1. Band machining makes use of a _____ blade. 1. _____
2. The cutting tool must be installed with the teeth facing _____. 2. _____
3. List three advantages band machining has over other machining techniques.

   _____

   _____

   _____
4. What two points must be considered when selecting a blade for a specific job?

   _____
5. Blade pitch refers to: 5. _____
   a. width of the blade in inches or millimeters.
   b. thickness of the blade in inches or millimeters.
   c. number of teeth per inch of blade or tooth spacing in millimeters.
   d. All of the above.
   e. None of the above.
6. Tooth form is the: 6. _____
   a. shape of the tooth.
   b. thickness of the blade.
   c. number of teeth on blade.
   d. All of the above.
   e. None of the above.
7. When making straight cuts, use the _____ blade the machine can accommodate. 7. _____
8. The joint of a properly welded blade should be as _____ as the blade itself. 8. _____
9. The blade must be _____ after welding because the joint is extremely _____ and cannot be used in this condition. 9. _____ _____
10. A _____ welder is used to weld band machine blades. 10. _____
11. Blade tension is the pressure put on the saw band to: 11. _____
    a. cut the metal more rapidly.
    b. keep it taut and tracking properly.
    c. reduce the power needed to do the cutting.
    d. All of the above.
    e. None of the above.

Name: _____

12. Cutting fluids are applied on the band machine in the form of:
    a. __?__ is recommended for heavy-duty sawing.
    b. __?__ is used for high-speed sawing of free machining nonferrous metals.
    c. __?__ are applied when the machine is not fitted with a built-in coolant system.

12. a. _____
    b. _____
    c. _____

13. What is the simplest form of band machining?_____

_____

_____

14. The worktable on many vertical band machines can be tilted to make _____ cuts.

14. _____

15. How can internal cuts be made on a band machine?_____

_____

_____

16. Smooth, uniformly finished surfaces are possible when the machine is fitted for _____.

16. _____

17. Describe friction sawing._____

_____

_____

_____

18. Of what use is a knife-edge blade on a band machine?_____

_____

_____

_____

19. When are diamond-edge bands used? _____

_____

_____

_____

20. What is unique about a diamond impregnated wire band? _____

_____

_____

_____

_____