

Grinding Machines

Module Outcome Summary

Information

<i>Instructional Area</i>	Machine Tool
<i>Instructional Level</i>	Apprentice
<i>Organization</i>	WTCS-Wisconsin Technical College System, State Machine Tool Apprenticeship Advisory Committee
<i>Development Date</i>	11/07/2001

Course Description

This module focuses on the terminology, construction and operations of grinding machines in the metal-working industry. Be aware that in-depth information regarding cutting tools, hardware and hand tools will be addressed in their own modules. Efforts should be made to reference information found in other modules in order to assist the apprentice in the application and assimilation of information.

Competencies

1. Advocate safe grinding machine practices

Conditions and Criteria

Competence will be demonstrated:

- by defending a friend and fellow machinist who was injured by NOT following safety precautions

Criteria - Performance will be satisfactory when:

- learner lists at least 10 safety precautions related to grinding machines
- learner can cite at least 5 potential hazards related to grinding machines
- learner explains the importance of good shop keeping procedures

Learning objectives

What you will learn as you master the competency:

- a. List and explain precautions for protection of : eye, ears, hands, fingers, feet
- b. Identify specific safety violations
- c. Explain the ways in which clothing can be a source of hazard near a grinding machine
- d. Describe how you would respond to a potentially unsafe situation or condition
- e. Explain the possible effects of NOT completing specific shop keeping practices
- f. Describe shopkeeping practices outlined in the text
- g. Relate a safety "war" story

2. Analyze machine tool capabilities by type and construction

Conditions and Criteria

Competence will be demonstrated:

- justify the choice of grinding machine for a given operation

Criteria - Performance will be satisfactory when:

- justification addresses multiple machine components (wheel size, size and style of work area, spindle location etc.)
- justification follows a logical sequence
- justification incorporates safe work practices

Learning objectives

What you will learn as you master the competency:

- a. Identify the major components of a grinding machine
- b. Identify the major types of grinding machines (internal, surface, cylindrical, tool and cutter, etc)
- c. Identify various machining operations performed on a grinding machine (slots, profile, taper, etc.)
- d. Review the safety concerns related to grinding machines
- e. Recognize the need for following recommended lubrication and maintenance schedules

3. Distinguish properties of abrasives

Conditions and Criteria

You will demonstrate your competence:

- justify the selection of an abrasive for a given operation

Your performance will be successful when:

- justification incorporates safe grinding practices
- justification recognizes efficiency in application
- justification recognizes the properties of the abrasive

Learning objectives

What you will learn as you master the competency:

- a. Identify natural abrasives
- b. Identify synthetic abrasives
- c. Compare the general applications of natural and synthetic abrasives
- d. Characterize the importance of grain properties in grinding applications

4. **Select the grinding wheel**

Conditions and Criteria

You will demonstrate your competence:

- justify the selection of a grinding wheel for a given piece part and/or operation

Your performance will be successful when:

- justification incorporates safe grinding practices
- justification recognizes efficiency of application
- justification recognizes factors involved in selection (piece part material and hardness, finish requirement, etc.)
- o justification incorporates information regarding the selection of wheel components

Learning objectives

What you will learn as you master the competency:

- a. Review safety concerns specific to grinding wheels
- b. Review types and styles of grinding wheels
- c. Recognize factors affecting wheel selection
- d. Identify the components of a grinding wheel (grit size, bond, grade, structure)
- e. Explain the purpose of the standard wheel symbol and marking system used in industry
- f. Review speed and feed applications to a variety of grinding machine applications
- g. Explain the process of balancing a grinding wheel
- h. Explain the process of truing a grinding wheel
- i. Differentiate between truing and dressing a grinding wheel

5. **Select work-holding devices**

Conditions and Criteria

You will demonstrate your competence:

- justify the selection of a work holding device given a piece part and an operation

Your performance will be successful when:

- justification incorporates safe grinding practices
- justification recognizes efficiency of application
- justification recognizes accuracy in the choice of work holding device
- justification recognizes rigidity in the choice of work holding device

Learning objectives

What you will learn as you master the competency:

- a. Review safety concerns specific to work holding
- b. Review types of work holding devices used on a cylindrical grinding machine (3 jaw, 4 jaw, face plate, collet, etc.)
- c. Review work holding devices used on a surface grinder other than magnetic chucks (precision devices such as v-block, vise, angle plate, magnetic parallels, etc.)
- d. Review types of work holding devices used on a surface grinding machine (permanent magnet, electro-magnetic chuck)
- e. Recognize factors affecting the selection of work holding devices on a variety of grinding machine
- f. Explain the process of re-surfacing (dressing) a magnetic chuck

6. Assess applications of accessories and auxiliary devices

Conditions and Criteria

You will demonstrate your competence:

- choose 3 applications for the use of a spin fixture.
- List the advantages and disadvantages of using coolant on a grinding machine
- Identify an appropriate application of laminated chuck blocks (magnetic parallels and v-blocks)

Your performance will be successful when:

- application recognizes angular capability
- application recognizes offset capability
- application follows safe grinding practices
- application recognizes accuracy
- application recognizes rigidity

Learning objectives

What you will learn as you master the competency:

- a. Identify auxiliary work holding devices used on the grinding machine (steady and follower rest, spin fixtures, collet holders, laminated chuck blocks and parallels, etc.)
- b. Identify accessory devices (digital readout, conversational-style CNC controllers, centerless attachment, radius fixture, etc.)
- c. Explain the advantages and disadvantages of coolant use on a grinding machine

7. Apply concepts of grinding machine tool operations

Conditions and Criteria

You will demonstrate your competence:

- create a set-up/operations sheet for a given piece part and/or operation on a cylindrical grinding machine
- create a set-up/operations sheet for a given piece part and/or operation on a surface grinding machine

Your performance will be successful when:

- set-up/operations sheet incorporates safety practices
- set-up/operations sheet incorporates accuracy
- set-up/operations sheet incorporates efficiency
- set-up/operations sheet incorporates logical thought

Learning objectives

What you will learn as you master the competency:

- a. Apply safe grinding practices
- b. Apply machine tool selection knowledge
- c. Apply abrasive and grinding wheel information
- d. Apply work-holding device knowledge
- e. Apply necessary information related to accessories and auxiliary devices
- f. Solve common problems encountered while performing grinding machine operations