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ABSTRACT

This set of two training outlines and one basic skills set list are designed for a machine tool technology program developed during a project to retrain defense industry workers at risk of job loss or dislocation because of conversion of the defense industry. The first troubleshooting training outline lists the categories of problems that develop in automatic screw machines, the variables that must be considered when troubleshooting automatic screw machines, and the specific topics that should be covered when training individuals to troubleshoot automatic screw machines. The second training outline lists 12 steps identified as the proper steps to use when setting up an automatic screw machine. The basic skills set consists of 8 lists containing a total of 132 specific skills required of operators of automatic screw machines. The skills are listed under the following category headings: basic controls and procedures; stock feed system; pushers and restocking; collet locking system; setting speed, feed, and stroke; basic tooling; controlling quality parts; and the recessing attachment. (MN)

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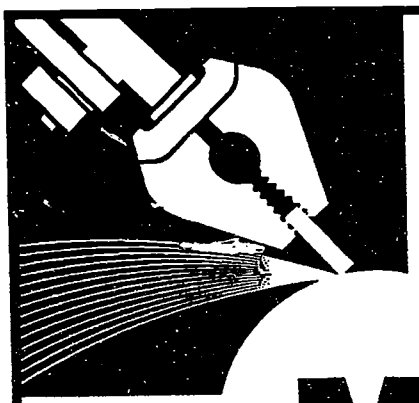

Machine Tool Technology

Automatic Screw Machine

Troubleshooting & Set-Up Training Outlines

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Alliant's Troubleshooting Training

Research based on the A.S.M. profession and interviews with your staff indicate all troubleshooting problems fall into four categories. Under each of the four categories, seven common variables influence the cause of the troubleshooting problem.

The four categories include:

1. Tool life
2. Variation
3. Concentricity
4. Surface finish

The seven variables include:

1. Spindle speed
2. Feed
3. Coolant
4. Tooling
5. Machine
6. Part
7. Operator interaction

Your operators suggest 80% of all troubleshooting on the Alliant shop floor can be traced to a tooling problem.Therefore, a troubleshooting class should spend 80% of the time analyzing common tool and workpiece elements.

On the tool, operators should learn to check for:

1. Discoloration
2. Cratering
3. Built-up edges
4. Point of wear

On the workpiece's cut surface, the operators should look to see if the:

1. Tool rubbed
2. If work-hardened scabs are present
3. If the chips came away cleanly in operation

Operators should also learn about tool li e trouble, including:

1. Spindle speed influence
2. Feed rate influence
3. Coolant influence

Operators should also learn how to investigate tooling:

1. Cratering
2. Flank wear
3. Understanding rake
4. Determine clearance
5. Tool preparation techniques
6. Cams influence on tools
7. Various causes of chatter
8. How speed and feed influence tool life

The other 20% of the course should be concerned about:

1. Variation
   - The causes of dimension to dimension changes
   - The causes of piece to piece changes
2. Concentricity
   - Misalignment of tools to workpieces
   - Spindle carrier lockup
   - Slides wear
3. Surface Finish
   - Feed variables
   - Spindle speed variables
   - Tooling variables

The instructor may also look at troubleshooting "chronic" problems versus troubleshooting "incidental" problems.

Alliant's Set-Up Training

During Alliant's A.S.M. Set-Up course, the operators will learn through classroom presentation, shop floor demonstration and guided shop floor practice, the proper steps for setting tools.

1. The operators will begin the course by identifying and stating the purpose of the following tools:
   - Drills
     - Chipbreaker
     - Screw machine
     - Tapered shank
     - Tapered length fast spiral
     - Spot
   - Form Tools
     - Dove tail
       - Roughing
       - Finishing

2. The instructor will present part specifications and layout information required to properly set the tools.

3. The operators will evaluate the part specifications and layout information to set required tools and devise strategies for setting the tools.

4. The instructor will demonstrate the Alliant approved strategies for mounting the above tools in their tool holders.

5. Operators will mount tools in their tool holders through guided practice with the instructor.

6. The operators will adjust the positive stops to the correct amount of tension when setting tooling.

7. The operator will be required to mount, set up and adjust a drill on the center tool slide to the satisfaction of the instructor.

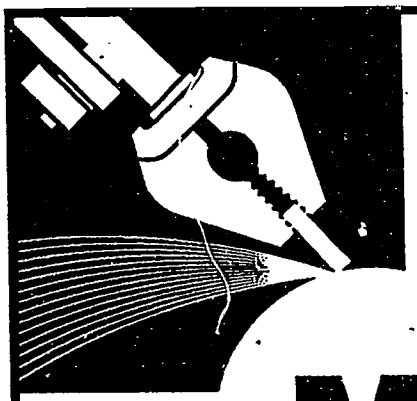
8. The operators discuss the standard angle for the cutting edges of a spot drill with the class.

9. The operators will have the ability to correctly identify the information stamped on tool holders.

10. The operators will have the ability to explain mounting tool holders techniques on various type of slides.

11. The operators will demonstrate how to center a tool in a time effective manner.

12. The operators will demonstrate the order in which he or she must set up a drill, a rougher or a finisher to the satisfaction of the instructor in a time effective manner.



Machine Tool Technology

Automatic Screw Machine

Basic Operator's Skills Set List

Basic Controls & Procedures

The operator will:

1. Locate and explain the purpose of the main power switch
2. Locate and explain the purpose of the front and rear control switches
3. Locate and explain the purpose of the take control switch
4. Locate and explain the purpose of the main motor switch
5. Locate and explain the purpose of the main motor start
6. Locate and explain the purpose of the feed on and feed off
7. Locate and explain the purpose of the auxiliary lever
8. Locate and explain the purpose of the lubricating oil sight gauge
9. Locate and explain the purpose of the lubricating oil dip stick
10. Locate and explain the purpose of the hand crank
11. Locate and explain the purpose of the spindles
12. Locate and explain the purpose of the spindle drum
13. Locate and explain the purpose of the high speed clutch lever
14. Locate and explain the purpose of the coolant pump control
15. Locate and explain the purpose of the chip conveyor and chip conveyor control
16. Locate and explain the purpose of the cross slides
17. Locate and explain the purpose of the center tool slides
18. Locate and explain the purpose of the threading slides
19. Locate and explain the purpose of the air regulator
20. Explain the indexing features on the machine
21. Explain the positing features on the machine

22. Explain the approach features on the machine
23. Explain the feed features on the machine
24. Explain the high point or dwell on the machine
25. Explain the drawback features on the machine
26. Operate the basic controls on the machine
27. Start the machine suing the operating control panel
28. Stop the machine using the control panel
29. Operate the hand crank to move the machine forward and backward

Stock Feed System

The operator will:

1. Locate and explain the purpose of the stock reel
2. Locate and explain the purpose of the stock feed cams
3. Locate and explain the purpose of the feed tube
4. Locate and explain the purpose of the feed finger
5. Locate and explain the purpose of the pusher assembly
6. Locate and explain the purpose of the stock stop
7. Locate and explain the purpose of the stock tubes
8. Locate and explain the purpose of the stock feed slides
9. Locate and explain the purpose of the collet
10. Locate and explain the purpose of the collet tube
11. Locate and explain the purpose of the pusher spool
12. Locate and explain the purpose of the guide bushing

Pushers and Restocking

Removal and Replacement of Pushers and Restocking

The operator will:

1. Remove and replace the pusher
2. Clean the feed tube and the feed fingers
3. Remove oil, dirt, and chips from all surfaces
4. Inspect the feed fingers for wear or damage
5. Inspect the gripping surface of the feed fingers
6. Explain why worn gripping surfaces on the feed fingers will not hold stock
7. Remove and replace the feed fingers on one pusher
8. Load bar stock into all spindles of a machine

Collet Locking System

The operator will:

1. Locate and explain the purpose of the collet
2. Locate and explain the purpose of the collet tube
3. Locate and explain the purpose of the collet lever body
4. Locate and explain the purpose of the collet hand operating lever
5. Locate and explain the purpose of the collet tension adjusting nut
6. Locate and explain the purpose of the collet nut locking pin
7. Locate and explain the purpose of the spindle alignment pin
8. Remove collets and/or collet pads
9. Disassemble collets
10. Clean collet assembly and spindle
11. Assemble collets
12. Adjust collet tension
13. Explain why an operator would remove and replace solid collets
14. Explain the adjustments you need to do to insure the collet locking pin is in place

Setting Speed, Feed & Stroke

The operator will:

1. Set up the coarse feed rate and spindle speed on a job
2. Mount the feed and spindle speed change gears
3. Change the cams that control the cross slides and center tool slide
4. Locate and explain the purpose of the positive stop screw
5. Locate and explain the purpose of the compensating screw
6. Locate and explain the purpose of the lead cam
7. Locate and explain the purpose of the guard cam
8. Locate and explain the purpose of the cam rise
9. Locate and explain the purpose of the cam rise
10. Locate and explain the purpose of the cam approach
11. Locate and explain the purpose of the cam feed
12. Locate and explain the purpose of the cam dwell
13. Locate and explain the purpose of the drum cams
14. Locate and explain the purpose of the feed range gears
15. Locate and explain the purpose of the spindle range gears
16. Locate and explain the purpose of the feed change gears
17. Locate and explain the purpose of the spindle change gears
18. Locate and explain the purpose of the disk cams
19. Change the coarse feed range
20. Change the coarse spindle speed range
21. Remove and replace the feed and spindle speed change gears
22. Remove and replace each type of cross slide cam on the machine
23. Remove and replace the center tool slide cam

Basic Tooling

Identification and Setting of Basic Tooling

The operator will:

1. State the purpose of a chipbreaker drill tool
2. State the purpose of a screw machine drill tool
3. State the purpose of a tapered shankdrill tool
4. State the purpose of the tapered length fast spiral drill tool
5. State the purpose of the spot drill tool
6. State the purpose of the dove tail form tool
7. Mount drill tools and form tools in their tool holders
8. Mount and adjust tools to produce part specifications using given layout information
9. Adjust the positive stops to the correct amount of tension
10. Mount and set up a roughing form tool
11. Mount and set up a finishing form tool
12. Mount and set up, and adjust a drill on the center tool slide
13. Describe the standard angle for cutting edges of most drills
14. Describe the standard angle for the cutting edges of a spot drill
15. Describe the purpose of a flanking holder
16. Explain how to get a tool on center
17. Explain where the coolant line should be located

Controlling Quality Parts

The operator will:

1. Identify and explain the most common causes of chatter
2. Identify and explain how to correct the most common causes of short feed
3. Sharpen a cut off blade
4. Sharpen form tools
5. Sharpen drills
6. Explain what a sharpened cutting tool will do to a part
7. Explain what a dull cutting tool will do to a part
8. Explain how to prevent a newly sharpened cutting tool from chattering
9. Explain the first check after mounting the tool holder and cutting tool
10. Explain the causes for looseness and play on a cross slide
11. Explain why feed rate is important
12. Explain why a dirty collet can cause chatter
13. Explain why collet problems can result in short feed
14. Explain why end tools cause short feed
15. Explain what must be done before removing a drill for sharpening
16. Explain what will happen if the angle of a drill tool is too great
17. Check for bent drill tools
18. Explain the procedures used before loosening clamps and removing cut off blade for sharpening
19. Explain the causes for a tip or burr on a part
20. Explain what will happen if the rake and relief angles are not the same after sharpening a form tool

The Recessing Attachment

The operator will:

1. Mount the recessing attachment to the turret tool slide
2. Adjust the recessing attachment to correctly control the location of cut
3. Adjust the recessing attachment to correctly control the depth of cut
4. Explain where the recessing attachment is mounted
5. Explain what type of bolts are used to hold down the recessing attachment
6. Explain where the loose end of the pull rod is mounted
7. Explain what the centering slot on the recessing attachment is used for
8. Explain the purpose of adjusting the screw on the recessing attachment
9. Explain the purpose of the gib adjustment of the recessing attachment