EML2322L – MAE Design and Manufacturing Laboratory

TA Outline (Remaining Equipment Training)

BEFORE LAB

- Read over safety rules for Marvel, DoAll, drill press, sander and grinder

DURING LAB

- Split into normal work groups
- Students need their **safety sheets,** a **writing instrument** & **safety glasses**
- Improper Shoes or No Safety Sheets: students stay this week but mark '**S**' or '**SS**' next to their name in roster; tell them to bring proper shoes or print out new copy for next week
- Remember to **remove all jewelry & watches**, tuck in loose clothing, tie hair back

Drill Press Training

1. Never wear **gloves**; always wear **safety glasses**
2. Works like drilling on the milling machine, except it's **quicker** to setup but **less accurate**
3. Explain the process of **clamping workpiece** using the vise or clamps (NEVER your hands)
4. Mention table adjusts vertically for shorter / taller workpieces; be cautious when doing so
5. Before drilling check that you aren't about to drill through the **vise or drill press table**
6. Explain the **three types of drill bits** used in the drill boxes (lettered, numbered & fractional); remind students to put them back in their proper location
7. Always **adjust the speed** while the drill press is running; use slower speeds for larger drills
8. Use **cutting oil** when drilling to extend tool life; deeper holes require more lubrication
9. Remind students to **peck drill** to evacuate chips; rule of thumb is peck 25-50% of diameter
10. NEVER remove **chips** with your bare hands
11. Clean up workstation just like the mills or lathes

- *No need for everyone to drill holes since they've already done so on the mills*

Marvel Vertical Bandsaw Training

1. Never wear **gloves**; always wear **safety glasses**
2. Setup for cutting **aluminum ONLY**; **never** cut plastic because it clogs the coolant pump; ask for help cutting non-hardened ferrous metals on other saws (Mike will guide you)
3. Explain how to **clamp workpieces** properly. Ensure the vise is clean and the workpiece being cut is clamped securely before turning on the saw
4. Discussion about **proper use of power feed;** proper procedure is: (1) firmly clamp the workpiece in the vise; (2) adjust the blade force; (3) turn on the saw so the blade is rotating; (4) adjust the coolant if necessary; (5) gently bring the moveable saw blade into *light* contact with the workpiece by rotating the manual feed wheel; (4) engage the automatic feed; (6) disengage the power feed after the workpiece has been cut but **before the blade passes the workpiece**
5. When done **squeegee** the coolant and chips out of the vise and off the table
6. Use the **rag** to wipe your workpiece off ONLY (NOT the table)
7. When cutting **80-20**, turn the coolant control OFF and pick up your workpiece carefully
8. Give a brief explanation of using the Roll-In bandsaw using the attached points.

- *Demonstrate by cutting ½" off a piece of 80-20, intentionally turning off the coolant*

DoAll Vertical Bandsaw Training

1. Never wear **gloves**; always wear **safety glasses**; **earmuffs** are located on the side of the machine
2. Adjust the upper **blade guard** to within ¼" of the workpiece (while the machine is OFF)
3. **Push the workpiece against the blade gently** so the part does NOT chatter; if it's unavoidable, slow down and/or find a more rigid method to support/clamp the workpiece
4. Keep your hand out of the **plane of the blade**; use a push block for small work so if it slips off it will collide with the blade instead of your hand or fingers
5. Sweep **debris** into the trashcan using the broom located underneath the machine when finished

- *Demonstrate on a piece of sheetmetal*
- *NOTE for straight cuts in sheetmetal, use a shear instead of the bandsaw*

Disc Sander Training

1. Never wear **gloves**; always wear **safety glasses**
2. Sanders work fine for both **ferrous and non-ferrous materials**
3. On the disc sander always use the **downward motion side** of the disc to sand; never use the upward motion side, as this can throw the workpiece upwards with TREMENDOUS force
4. Always place your work against the **steady rest**
5. Do not use the sander for **bulk material removal** (more than 1/16"); rather, cut the workpiece in the bandsaw or on the milling machine and *then* sand or file if necessary
6. Never sand parts that are **extremely hot**, as doing so destroys the sanding disc; instead, frequently cool the work using the nearby water container
7. **Sweep up debris** with the broom located underneath the sander and empty in trashcan

- *Demonstrate on a piece of aluminum sheetmetal or bar stock*

Pedestal Grinder Training

1. Never wear **gloves**; always wear **safety glasses**
2. Never grind **non-ferrous materials** (i.e. ALUMINUM, brass, plastics, etc.) as doing so will clog the porous grinding wheel, which can cause it to overheat and explode
3. Never grind on the **side of the wheel**, only the front face
4. **NEVER touch** any part of the grinding wheel with your body. If the grinder is running, your hand can easily get pulled between the grinding wheel and the steady rest. Furthermore, it is often impossible to discern whether a grinder is running or not, so even if it appears to be off, NEVER touch any part of the wheel with your body
5. Use **pliers** or a clamp to hold small pieces to protect your hands
6. Never use **excessive pressure** while grinding, as one slip can result in your hand contacting the wheel and being rapidly abraded
7. **Sweep up debris** with the broom located underneath the sander and empty in trashcan

- *Demonstrate on a piece of steel plate*

Ajax Training (so TAs are prepared to help students once prototyping commences)

1. Use a gentle hand on the power switch, as it is easy to accidentally engage reverse when turning the Ajax OFF. When you hear the motor de-energize, cease all motion on the power switch.
2. Be careful not to accidentally bump the power switch with your body.
3. Spindle speed, feedrate & power feed direction must be changed while the machine is OFF. Always adjust these settings for the course students.
4. Longitudinal and cross feeds BOTH move toward or away from the spindle, which is opposite from how they behave on the Southbend lathes.
5. The Ajax cuts on the radius (not on the diameter like other lathes in the lab).

Roll-In Training (so TAs are prepared to help students once prototyping commences)

1. Like all bandsaws in the lab, hardened material should never be cut on the Roll-In
2. The Roll-In saw is used to prevent an equipment bottleneck on the Marvel bandsaw; it's well suited for cutting 80/20, motor mount material and hollow cross sectional shapes, like round or box tubing. It is not well suited for cutting shapes with CSA > 2 in^2 (like 2" round stock).
3. Due to the thinner blade on the Roll-In, it has a propensity for the blade to pass the workpiece upon exiting each cut, so teach students to turn the machine off after making a cut, remove the workpiece from the vise, and finally retract the blade to its original position.
4. Never tighten the viscous damper adjustment knob, as doing so can damage the precision needle valve seat; always be gentle when closing the valve
5. Turn off the saw before retracting the blade to prevent it from being pulled off its roller guides.

- *Demonstrate by cutting ½" off a piece of 80-20, intentionally letting the blade pass the workpiece and showing how to recover, as explained in point (3) above*