Green Part Seminar Lathe

*Overview* (you may want to bring a water bottle)

Welcome to the green permit seminar, my name is…

Today we will be learning about…

Safety:

Use common sense; don’t do anything you’re not comfortable with. Locate E-stops and breaks before starting. Wear safety glasses, avoid loose clothing (e.g. sweat shirts, hijabs), roll up sleeves, no jewelry, and restrain long hair and no gloves. Keep things orderly and clean. Talk about the girl that died at Yale and the mistakes she made also the guy who cut off his fingers in the shop.

Print:

Look over print, think about order of operations, tooling needed, time estimation (setup vs machining time)

Equipment:

1. Where to check out tools
2. Show how to use instructional videos and the digital readout (reads on diameter not radius).
3. Talk about machine terminology (chuck, compound, carriage, tailstock, levers, footbrake, power switch, e-stops, spindle rpm control, HSS vs carbide, dead vs live center)
4. Talk about tooling used and tool terminology (center drill, drill bits, tap, counter sink, tap handle, file, drill chuck, R8 & 5C collets, tool holder, facing, turning, right and left hand cutters, ways, and tool post) and tool clearances.
5. Show how to measure properly using a digital caliper including cleaning, zeroing, and proper care.
6. Show measuring tooling before starting. Talk about the drill charts

*Machining*

Setup:

Begin machine setup (compound forward, put machine in neutral before touching chuck to avoid accidently turning it on while working on it). Check part for burrs, remove with file. Talk about stock protrusion (1.5 times dia.), tool height, tool touch off from face O.D., calculate proper RPM (800-1000), go slower for countersinks ( 250 RPM), reamers, boring bars, large drill bits, proper chucking on beta part, show how to set digital read out.

Start Cutting:

Begin machining part by first facing the end (note differences between alpha and beta part) and then turning O.D. dimension. Talk about roughing and finishing passes (.03” - .05” roughing & .015” - .01” finishing, different for different materials). Talk about removing chips with chip brush or pliers, never hands. Talk about how to turn hand wheels, when it’s appropriate to use one vs two hands.Talk about the proper way to finish shoulder and proper way to hold file for de-burring.

Drilling & Tapping:

Begin drilling and tapping operation by showing how to properly install and use the drill chuck, center drill, peck drilling. Chamfering and tapping. Talk about proper depth for center drill. Remember to talk about 1.5 turns with tap handle and reversing for chip breaking also remembering to use cutting oil. 75% hole for tap may need larger hole (smaller %) for harder material, see tap/drill chart for correct drill size.

Final Notes:

Remind students to ask for staff help, cleaning the shop area and machine (put lathe in neutral) when complete.

Optional Break (Time permitting, ask if anyone needs a 5 minute break)

Green Permit Seminar Mill

*Overview*

Welcome back…

Equipment:

1. Explain how to use the DRO (main menu, mode selections, entering numeric data, abs set)
2. Talk about machine terminology (table, speed change, high/low range selector, collect closer, quill, spindle, x,y,z axis,). Explain how the Z power feed operates and how the motor needs to stop before changing directions. Talk about the limits of x,y,z travel (shearing way cover bolts).
3. Show how to set the depth stop and explain why it is important. Show how to use the quill DRO.
4. Cover installing and removing collets (make sure it is clean), don’t over tighten. Mention that endmills only go with collets.
5. Talk about tool terminology (HSS vs carbide, etc., remind about R8 vs 5C collet, end mills, center drills, drill, tap, dead center, parallel, mill vise, collet, soft blow hammer, edge finder, countersink and drill chuck).
6. Talk about tool geometry (drill don’t cut in the center or on edge, plunge vs non-plunging endmills)
7. (optional) Discuss Climb vs Conventional milling (most people won’t understand without a picture)

Machining:

Clean vise and make sure it is indicated in and properly clamped, clamp part in vise, install endmill, explain how to adjust RPM and machine part to length if alpha part, then machine both flats showing how to touch off part with end mill and set stop and readouts for depth, remove endmill and install drill chuck, install edge-finder in chuck or collet, adjust RPM to 600-800 and discuss how to use (explain why we indicate off of the fixed jaw), locate for tapped hole and finish drilling, chamfering, and tapping hole.

- 800 rpm for machining

- 250 rpm for filing and countersink

Final Notes:

Remind students to ask staff for help when needed, clean machine and shop area, check tooling back in, fill out measurements on sheet, next steps… Tell students they are welcome to make the part again if they feel they would like more practice or haven’t machined in awhile.