Manufacturing

TMJ3C / TMJ4C
Fire Piston Project

Project Outline

The purpose of this practical assignment is to teach metal lathe basics such as end facing, parallel turning, drilling, threading, turning grooves, and turning angles on a manual metal lathe. This project can be used as a refresher project for a student moving from TMJ20 to TMJ3C or as a way of introducing the above skills to a student new to Manufacturing Technology.

Learning Goals

By the end of this project the students will:

- Learn basic lathe operation.
- Understand tap drill sizes and how to read the tap drill chart.
- Learn the process of cutting threads using taps and dies.
- Learn the process of reaming a hole.
- Learn the process of reaming cutting a groove.

Student Activities

Activity 1 – Machining the Fire Piston Cylinder (150 minutes)

Activity 2 – Machining the Fire Piston (150 minutes)

Activity 3 – Machining the .3125 End Cap (150 minutes)

Activity 4 – Machining the .375 End Cap (150 minutes)

Activity 1

Machining the Fire Piston Cylinder

The goal for this activity is for students to learn and demonstrate the proper setup of tooling and the workpiece. Students will demonstrate how to select proper RPM for the material type and size as well as select the correct order of operations. Students will learn how to read a tap drill chart and learn the importance of selecting the correct drill size for the tapped hole. Students will also learn about different fits and how to properly ream a hole.

What is a fire piston?

Fire Piston Cylinder Drawing

toolSAFE Lathe Safety Video

Lathe SAFEdoc and Test

Drill and Tap Charts

Additional Materials: Bandsaw, metal lathe, lathe tooling, hand file, micrometer, vernier

Activity 2

Machining the Fire Piston

The goal for this activity is for students to practice and build on the skills learned during activity 1. Students will use the form tools for cutting the groove and select the proper drill for the tapped hole using the tap drill chart and knowledge learned from activity.

[Fire Piston Drawing]

Additional Materials: Bandsaw, metal lathe, lathe tooling, hand file, micrometer, vernier, o-ring

Activity 3

Machining the .3125 End Cap

The goal for this activity is for students to practice and build on the skills learned during activities 1 and 2. Students will learn the correct way to thread using a die and die set. Students will use a grooving tool and knowledge from activity 2 to cut the groove at the base of the thread.

5/16" End Cap Drawing

Additional Materials: Bandsaw, metal lathe, lathe tooling, 5/16”-18 die, hand file, micrometer, vernier

Activity 4

Machining the .375 End Cap

The goal for this activity is for students to practice and build on the skills learned during activity 1, 2, and 3. The last component gives students the opportunity to practice the skills learned in the previous activities.

3/8" End Cap Drawing

Fire Piston Rubric

Additional Materials: Bandsaw, metal lathe, lathe tooling, 3/8”-16 die, hand file, micrometer, vernier

Lesson Plan

For complete lesson plans, instructional materials, and additional handouts click this link.