

Spray Lathe



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Introduction

Mettech is looking to design and fabricate a spray lathe to increase spraying process efficiency and enable the spraying of larger and heavier parts.

Background:



Figure 1 – Axial III Plasma Spray Torch

In the plasma spraying process, an electric arc is struck through a stream of gas which gets heated to plasma. A powdered material is then injected into the plasma, where it melts and accelerates toward the part to be coated, called the substrate. The sprayed molten droplets splat onto the substrate, cool and harden to form a coating. This process creates industrial coatings used for their mechanical properties such as wear resistance or thermal resistance.

Mettech is primarily a plasma spray equipment manufacturer. However, with an increasing demand for coating services in recent years, we have gradually developed in-house capabilities to apply industrial coatings for our customers. Nevertheless, due to our limited capabilities, we had to turn down several projects or put together jigs that did the job, albeit inefficiently.

To be able to coat parts more efficiently as well as accommodate larger and heavier parts, we would like to design and fabricate a spray lathe. This is essentially a lathe where the workpiece is the substrate being sprayed on rather than machined.

Brief Project Description

The purpose of this project is to design and fabricate a spray lathe. This includes the following:

- 1) Analysis of constraints within the spray shop
- 2) Designing the spray lathe comprising of the following items:
 - a. Frame
 - b. Motor and controller
 - c. Mechanical components such as bearings, pulleys, etc.
- 3) Overseeing parts fabrication at a machine shop
- 4) Assembly and testing

Expected Outcomes

Here are some of the milestones along with their deadlines:

- 1) Finalized design – November 30th, 2020
- 2) Fabricated spray lathe ready for testing – February 28th, 2021
- 3) Testing and future recommendations – March 31st, 2021

Resources Available from the Customer

- 1) Access to Mettech's facility to assemble and test the spray lathe
- 2) Immediate supervision by Product Development Engineer EIT and further supervision by P.Eng.
- 3) Funding to produce the spray lathe

Customer Requirements

Must have:

- 1) Adjustable chuck-to-chuck distance: up to 10 ft
- 2) Max. length of lathe: 15 ft
- 3) Min. diameter of workpiece: 30"
- 4) Height from floor to chuck centerline: 36-40"
- 5) Min. weight capacity: 1000 lbs supported on both ends
- 6) Chucks:
 - a. One 10" headstock chuck (driven)
 - b. One 8" tailstock chuck (freewheel)
 - c. Plain back
 - d. 3-jaw
- 7) Motor
 - a. with controller and brake
 - b. chuck speed range: 50-1000 rpm
- 8) Lathe bed:
 - a. On wheels or rollers for moving around
 - b. On 4 screw jacks when parked
 - c. 4 locator pins at each corner for positioning/alignment
- 9) Maximum overall cost of parts and fabrication: CAD \$10,000

Nice to have:

- 1) Ergonomic design
- 2) Compact frame
- 3) Shorter overall length when spraying shorter parts
- 4) Low cost
- 5) Aesthetic design