

POWDERED ALLOY PACKING SYSTEM FOR ADDITIVE MANUFACTURING



Objective and Value Proposition

Additive manufacturing such as cold spray, direct energy deposition, or powder bed methods use metal powder to make intricate parts in a fast and efficient manner. The alloys used for additive metal manufacturing are often sensitive to environmental conditions such as oxygen or moisture. Our team has been tasked with creating a system that will quickly and safely package reactive metal powders, such as ATI C103™, in an inert environment for transport.

Background

ATI C103™ is a niobium-based refractory alloy used for a variety of high temperature applications. A particularly famous use of this material was for the rocket nozzle of the Apollo Program Service Module. This alloy is considered a combustible dust, similar to other reactive metals such as Ti, requiring packaging in an inert gas environment.

Key Requirements

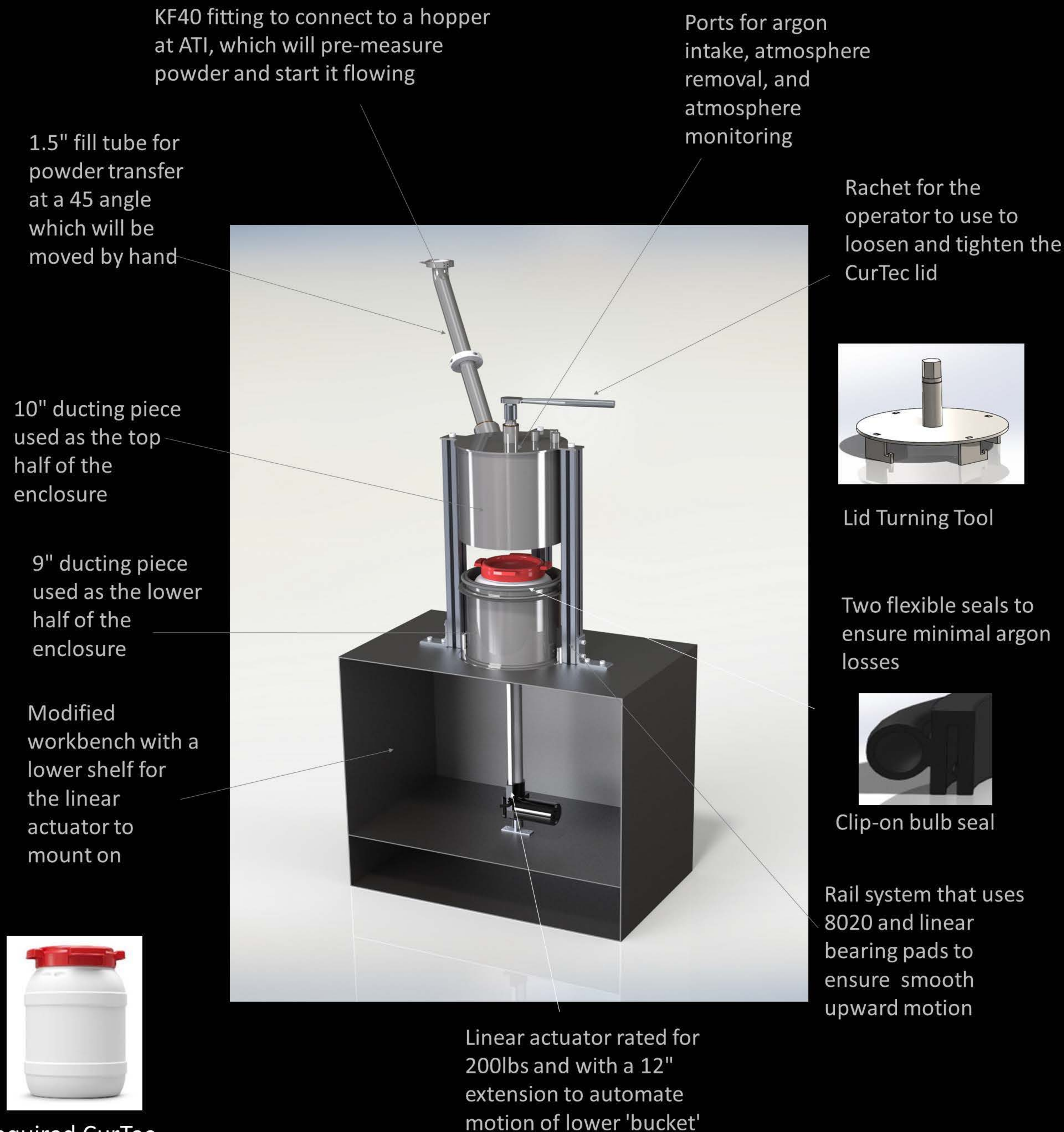
- I Powder must be packaged within an inert argon atmosphere
 - Oxygen levels of 500-1000 ppm
 - Relative humidity levels of <1%
- I Components in contact with powder must be stainless steel
- I Container lids must be fitted and tightened before removal
- I Ergonomics must be maximized for system operators
- I Packaging system must process at least 200lbs per hour
- I System must be easy to clear of powder
- I System must incorporate 6- and 3.6-liter CurTec containers

Required CurTec Container



CLIENT: ATI SPECIALTY ALLOYS AND COMPONENTS
 TEAM MEMBERS: NICK AYERS, AUSTIN BEYER, KAITLIN COAD, KATE SEEGMILLER
 FACULTY ADVISOR: DR. MATTHEW SWENSON
 GRADUATE MENTORS: ZACHARY HACKER, NICOLENE VAN ROOYEN

3D Model and Design



Solution



Summary

Currently, we have detailed 3D models of our design done as well as most of our main components purchased, machined, or welded. For future work, we recommend the following:

- Thorough testing of system purge time
- Modify fill tube to prevent accidental removal
- A selection of a heavier workbench

Acknowledgements

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