

Team 501 Project Charter

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Project Scope

Project Background

The AFRL (Air Force Research Lab) operates a laser powder bed fusion (LPBF) printer for additive manufacturing complex metal parts. Unused powder is either recovered and recycled or disposed. AFRL's interest is to develop hardware and procedures for increasing the amount of recycled powder. The proposed solution should be compatible with existing hardware and processes.

The existing process is broken into three phases. The first phase is built into the LPBF printer to recover bulk, unused, powder. The second phase is implemented when the part is removed from the printer. Essentially a “wet vacuum” is used to remove excess bulk material. This powder is deemed waste once it is saturated in the vacuum. The third phase takes place in a powder coating type enclosure. The part is loaded into the enclosure and is then blown with compressed air to remove residual powder caught in the geometric features.

Project Description

The objective of this project is to design a device which increases the amount of recycled 17-4PH steel powder in a LPBF process. This device should be compatible with existing hardware and processes, while ensuring the safety of the operators.

Key Goals

The key goals of this project were determined by breaking the project description into a list of achievable objectives. This helps to ensure that the project stays on track with the project description.

- Increase the amount of recycled powder in the LPBF process.
- Ensure the safety of any personnel using the powder recovery tools.
- Maintain compatibility with existing AFRL hardware and resources.
- Distinguish the location of the developed solution in the current process (systems engineering).

Markets

This project is relevant to a few markets. These were determined using the question: “where will this product be used?” Primary markets are the markets that are directly going to use our product, and the secondary markets are those that could use the product if they had access to it.

- Primary Markets:
 - The project sponsor, Dr. Flater
 - Other users of the LPBF printer at AFRL
- Secondary Markets:
 - Facilities that have similar LPBF printers
 - 3D printing enthusiast and shops that wish to use industrial 3D printers

Assumptions

The assumptions for this product are stated to help direct the project towards the project description, and to state what can and cannot be utilized.

- The 3D Systems ProX 300 is the operating LPBF printer, featuring a build plate volume of (W x D x H): 250 x 250 x 330 mm (9.84 x 9.84 x 12.99 in) (3DSystems, 2019).

- The only material to be used in the 3D printer for AFRL's purposes is 17-4PH steel.
- Any project solution has access to a 110 psi air compressor and a 110V wall outlet in the lab.
- The particle size of the 17-4PH steel powder is between 10 and 15 micrometers.

Stakeholders

The stakeholders for this project were determined by people with investment, interest, and control in the project. This is important to show who the project effects.

- Air Force Research Lab - AFRL is our key investor in this project, so a functioning product will be delivered to them.
- Dr. Flater - As our sponsor and investor, Dr. Flater has investment, interest, and control over the project's operations.
- College of Engineering - The success of this project will reflect well on the college, as the college has invested in our instructors and educational tools.
- Dr. McConomy - As our Senior Design professor and adviser, Dr. McConomy has a time investment in us, and has control over the program.
- Dr. Hruda - As our project adviser, Dr. Hruda has interest in the project and a time investment in us.

Code of Conduct

Mission Statement

Team 501 is committed to facilitating a positive work environment that supports professionalism, respect, and good ethics. Every member of the team will contribute to these goals with hopes of bringing out the best in themselves and the other members to benefit the project.

Team Roles

- Joshua Dorfman - Field Engineer. Responsible for managing project finances, purchases, and assembly.
- Vincent Giannetti - Manufacturing Engineer. Responsible for manufacturing leadership, additive manufacturing knowledge, and CAD assistance.
- Arlan Ohrt - Project and Systems Engineer. Responsible for project management, sponsor/instructor contact, document refinement, document submission, and system integration.
- Kevin Richter - Field Engineer. Responsible for adviser contact, CAD assistance, general research, and assembly.
- Noah Tipton - Design Engineer. Responsible for leading CAD, design specifications, and recording general information in meetings.

Methods of Communication

Discord will be used for messaging between group members. Acknowledgement of reading a message must be done within 24 hours. Discord will also be the main method of

sharing files under 8 Mb. Any files larger than 8 Mb will be shared on Basecamp. Basecamp will also be used to store all copies of documents prior to submission by the project engineer.

Dress Code

The T501 dress code policy applies to all group members. Group members are expected to dress in:

- Casual attire for group and advisor meetings.
- Business casual attire for meetings with sponsor.
- Business attire (suit and tie) for presentations and professional gatherings.

Group members must always present a clean, professional appearance. Facial hair must appear groomed and intentional. Clothing and grooming styles dictated by religion or ethnicity are exempt.

Attendance Policy

All meetings will have group member attendance kept. Reasons for any group member absences will be recorded, as well as how far ahead of time the absent group member notified the rest of the group of the absence. This will be done by Vincent in a discord text channel dedicated to this record.

Weekly meetings with the group adviser, Dr. Simone Hruda, will be every Friday at 12:00pm, held in room A234.

There will be a weekly meeting period scheduled for every Monday at 2:00-5:00pm, which all group members will be present for. If additional time is needed during the week to complete assignments, projects, or any group work, all group members agree to meet on Tuesday

and/or Thursday at 12:30-2:00pm. The location of the meeting will not be constant, so the location will be some agreed upon location within the engineering campus unless there are special circumstances.

Submission Policy

All assigned work must be sent to the project engineer at least 48 hours in advance unless extenuating circumstances are present. If such is the case, the project engineer must be informed as soon as possible and a group decision about the continuance of the assignment will be held.

McConomy Vacation Days will only be used for group assignments once a majority of the group agrees. If one group member would like to use a vacation day, they must get three out of five total group members to agree. If majority rule is established, those who are opposed to spending the vacation day still must spend the vacation day. If a group member has consumed all of their vacation days, there will be no grounds for the group to use any more vacation days on group assignments for the remainder of the semester.

Workload Policy

All group members are responsible for their "share" of the workload. Personal responsibilities are outlined in the "Work Breakdown" document which all group members have agreed upon. This document names every assignment in chronological order, broken down into specific sections which are named in their corresponding rubrics. Every group member has volunteered to cover an entire subsection, meaning they are responsible for not only a timely completion, but an accurate and professional final product.

Conflict Resolution

All conflict will be documented and signed by both the project engineer and the member(s) involved. Any major decisions will be determined by majority rule. Should majority rule fail to resolve the issue, Dr. McConomy will be notified. Dr. McConomy will have the final say in any and all disagreements.

Statement of Understanding

By signing and dating the below lines, we as the group members of Project T501 agree to adhere to the guidelines stated in this document, and will strive to complete the project with, character, honesty, and strength.

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

Name: _____ Date: _____

References

3DSystems. (2019). Retrieved from <https://www.3dsystems.com/3d-printers/prox-dmp-300>