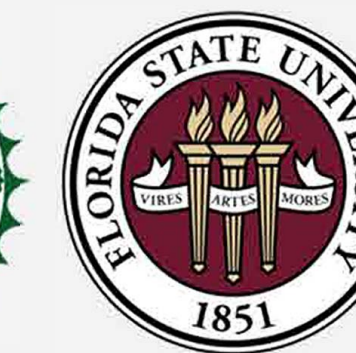


Polymer Infiltration Device for Cellular Structures

Michael Haimowitz | James Jenkins | Catherine Kent | Emily Stern | Phillip Stern



FAMU-FSU
Engineering

Integrity ★ Service ★ Excellence

Sponsor: Dr. Phillip Flater **Advisor:** Dr. Eric Hellstrom **Instructors:** Dr. Shayne McConomy & Dr. Chiang Shih

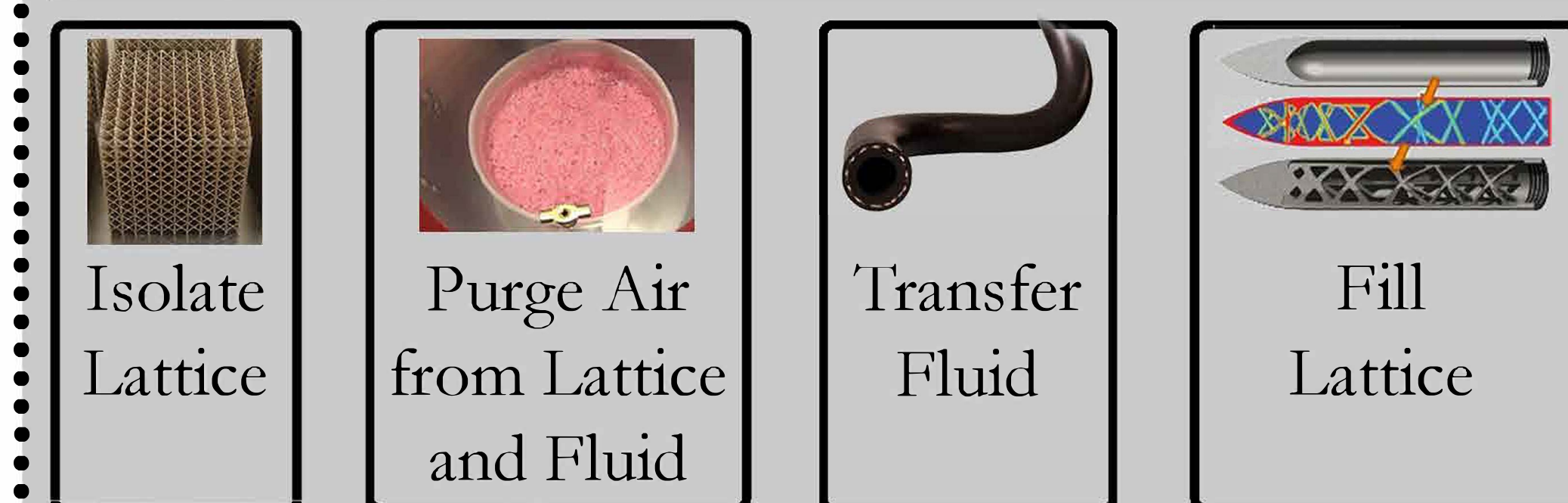
Project Scope

The purpose of this project is to design and build a prototype device that will **infiltrate** additively manufactured lattice structures of various sizes, shapes, and lattice configurations with Sylgard 184.

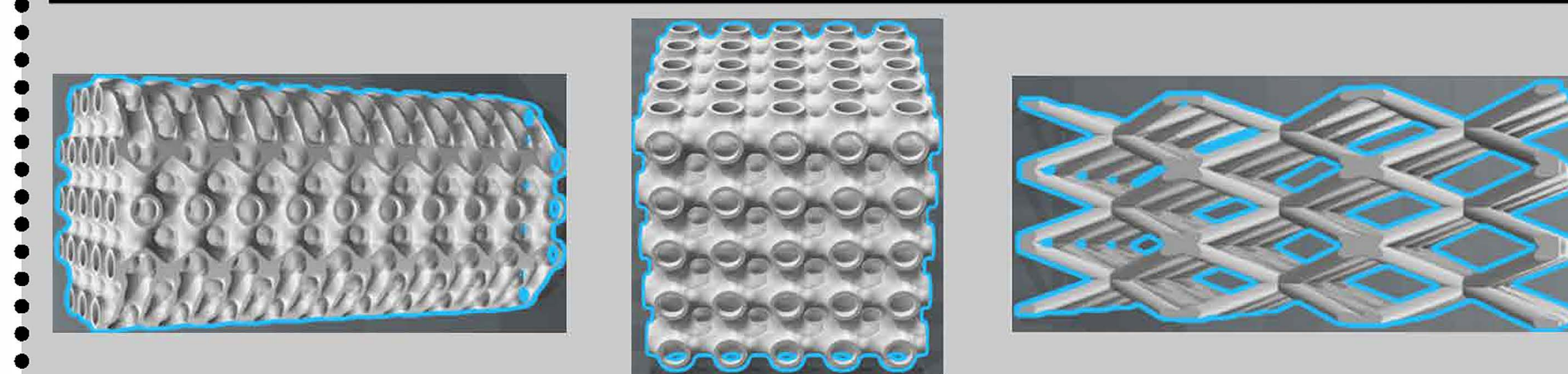
Project Purpose

The filled lattices will be used to tailor the ballistic responses of munitions. **Eliminating air voids** is of most importance in order to limit hot spots in munitions composites.

Functional Breakdown

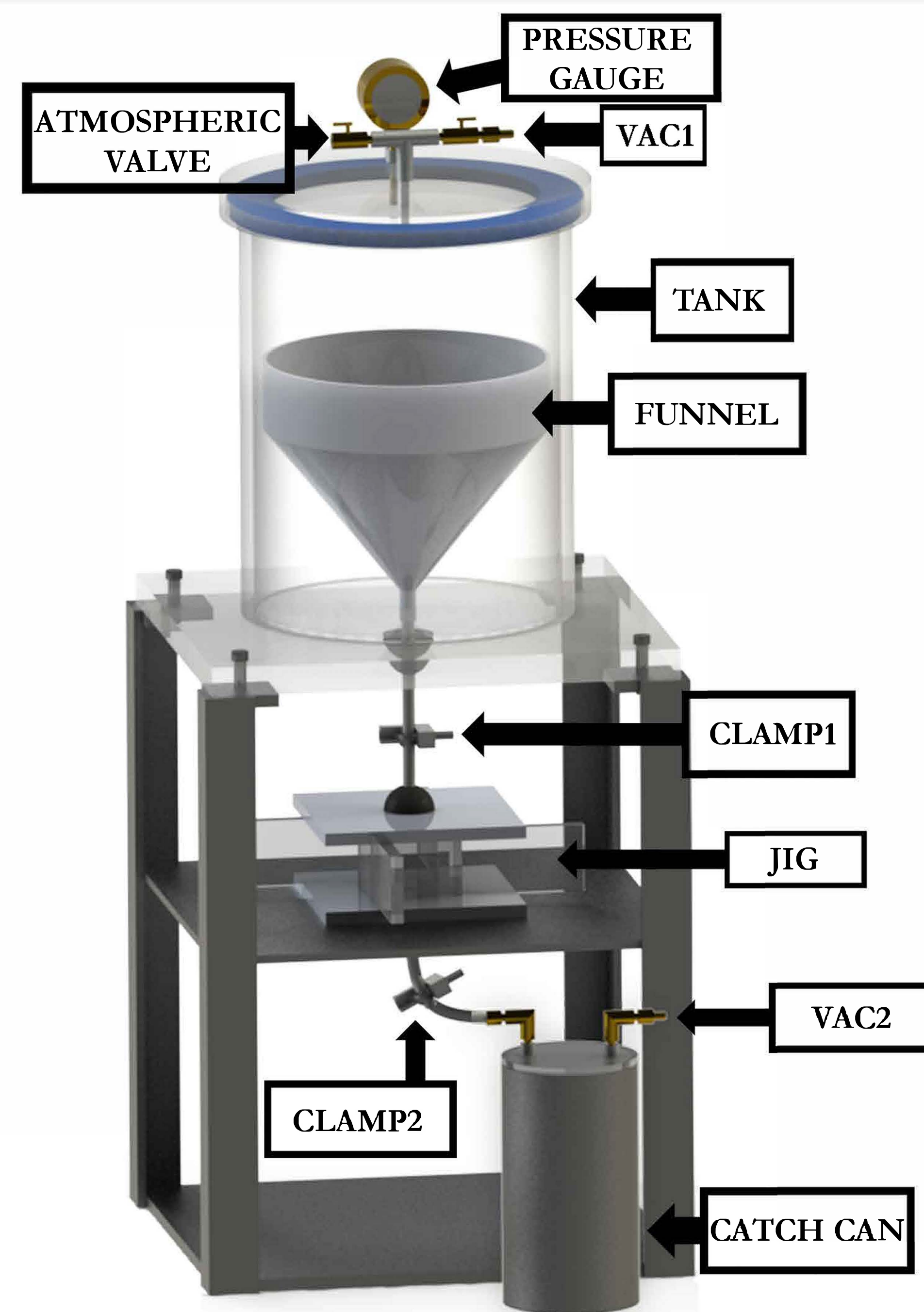


Cellular Structures



Acknowledgements

Dr. McConomy for his relentless support. **Dr. Flater** at Air Force Research Laboratory, Munitions Directorate for the 3D printed lattices and his guidance. And **Dr. Hellstrom** for helping us with the brainstorming process. Special thanks to **G5-Engineer Solutions** and **Ghost Controls** for use of facilities and personal assistance in construction of the prototype.



Iterative Design

The design was **iterative** and changed in order to use gravity to our advantage and a vacuum was chosen to degas the silicone in order to create the lowest **porosity**.

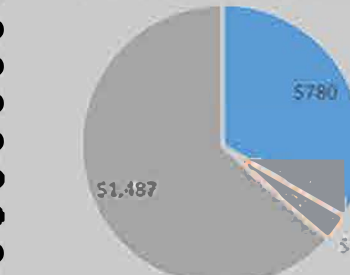
Prototype Operation

1. Close **CLAMP2**, Evacuate **Tank** and **JIG** via **VAC1**.
2. Close **CLAMP1**, Open **Atmospheric Valve**, Add Silicone
3. Close **Atmospheric Valve**, Degas via **VAC1**.
4. Open **CLAMP1**, Open **Atmospheric Valve**, Silicone Fills **JIG**, Evacuate **Catch Can** via **VAC2**.
5. Open **CLAMP2**, Silicone through **JIG** into **Catch Can**.
6. Close **CLAMP1** and **CLAMP2**, Detach **JIG**, Silicone cures.

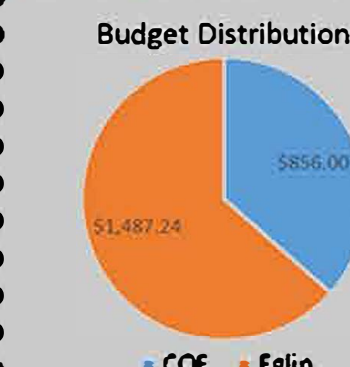
Semester Review

Project Progression was altered due to the design phase and procurement phase taking longer than planned. Despite this, the prototype was still assembled and finalized within the given time frame.

Purchase Distribution



Budget Distribution



- Finalize Concept Design
- Order Parts
- Assemble Prototype
- Test prototype
- Finalize Prototype

1-Jan 21-Jan 10-Feb 2-Mar 22-Mar 11-Apr 1-May

Future Work

Accommodate additional lattice geometries:

- High Aspect Ratios
- Independent Fill Regions