By **engaging** with our campus resources, we developed a **collaborative project** to build an **essential piece of conservation equipment.**

Partnering with Senior Engineering Students:

Design & Prototype building of Document Encapsulator

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PROBLEM

Encapsulation of flat paper collection items between polyester film is a standard practice preservation strategy. Equipment currently available on the market for encapsulation either employs heat or an ultrasonic welder to create the seams in the polyester film. This equipment is only produced by limited sources and can be cost-prohibitive.

APROACH

Texas A&M College of Engineering has an annual call for proposals for senior Capstone Projects (MEEN 401&402), a senior class project for engineering students to work with a client to create a product from concept to design to production. The Preservation unit submitted an open proposal to develop an encapsulation system for flat paper objects inside preservation approved materials. Our proposal was selected by a group and Team Library was launched.

PROJECT SCOPE

We developed a list of needs and considerations for the Capstone team. We specified materials for encapsulation but left the mode of how the seal is made up to them to explore, as long as it fit into the object safety parameters.

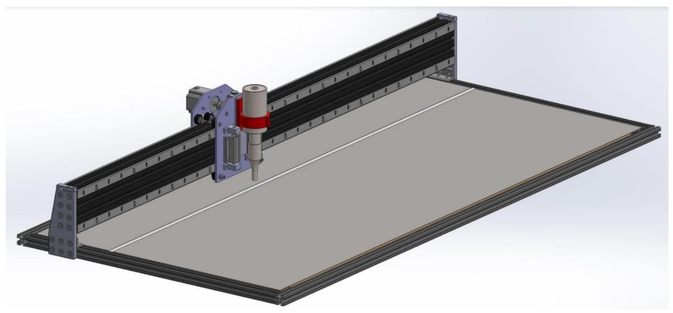
NEEDS ANALYSIS

Machine	Media	Material	Seal
Durable Operational for several hrs a day/5days a week	Encapsulate various sizes, small to oversize	Join various thickness of Mylar, 2-5mm	Reversible Item can be removed, unaltered
Maintainable Can do in-house maintenance	Encapsulate various items: paper, buttons, pins	Join various types of Mylar	Ability to control precision and size of seal
Ease of Use Can allow a student to use minimal training	Encapsulate friable media (containing very little binding agent)		Ability to create gaps in seal
Ability to stop and start under control			

CONCEPT REFINEMENT

The team developed and presented five possible concepts, including variations for: handheld sealer; two axis belts to be more automated; two machines variation based on document size. All concepts included an ultrasonic welder.

INITIAL 3D RENDITION

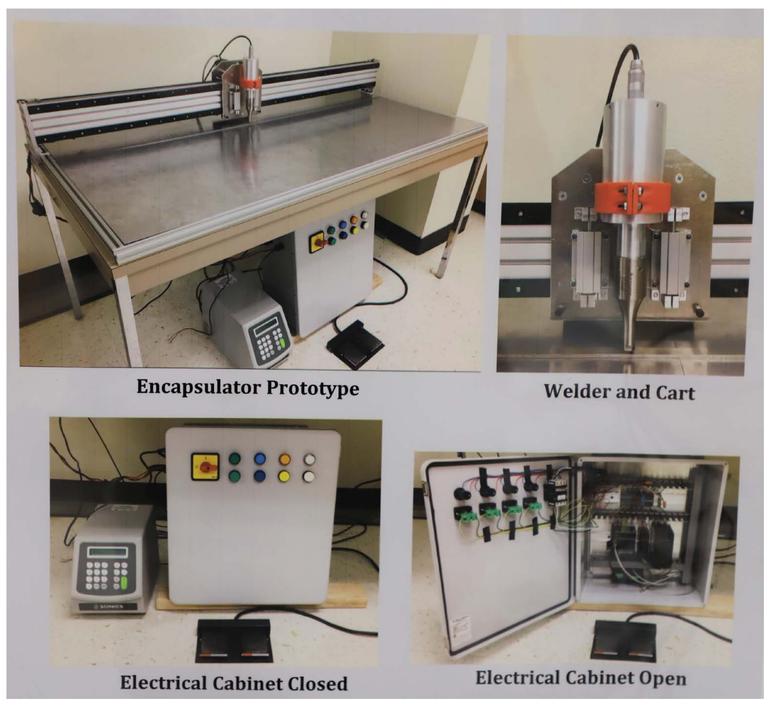


STUDENT DESIGN METHOD

The team incorporated engineering project management and design strategies to refine, test, and evaluate the concept. Validation plan was required which included testing the seal strength using tensile and vertical applied pressure tests, and testing the tolerance of the guide (gantry) system. Design phase concluded in Fall semester, and materials sourcing and build took place in the Spring.

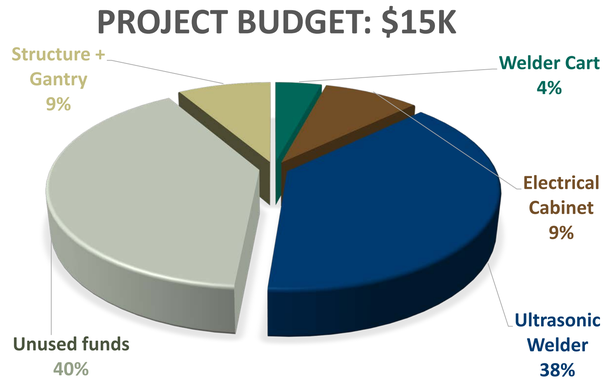
RESULTS

Deliverables: fully operational prototype with manual and full documentation. Design includes: off-the-shelf removable ultrasonic welder locally sourced, 3D printed part components, interchangeable welder tip, digital control box to adjust percent strength of the weld, and additional seam types, such as variant dash lines.

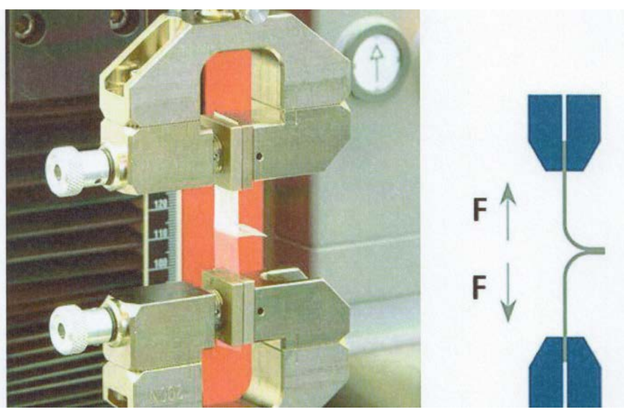


SENIOR ENGINEERING STUDENTS

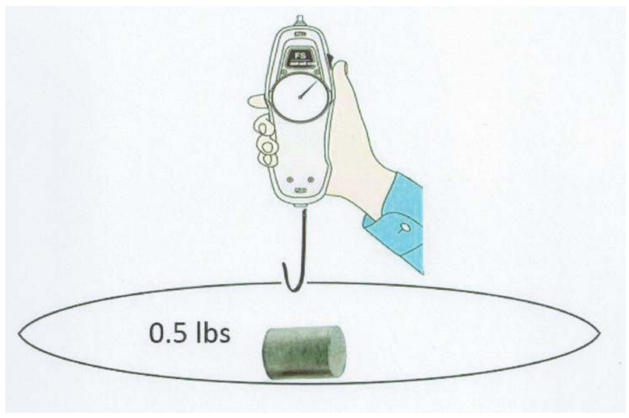
PROJECT BUDGET: $15K



TENSILE TEST SEAL STRENGTH



TESTING ALL FOUR SEAMS



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