M1.02 – 3-Axis Composite Filament Winder

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BOBCAT AEROSPACE

Problem Statement

Composite materials are an integral part of the engineering curriculum, in which students are exposed to traditional production techniques. While these processes remain relevant in many industries, the curriculum lacks exposure to modern, large-scale composite manufacturing methods. Expanding the program's focus to include mass production techniques would better prepare students for current and emerging industry demands.

Project Description

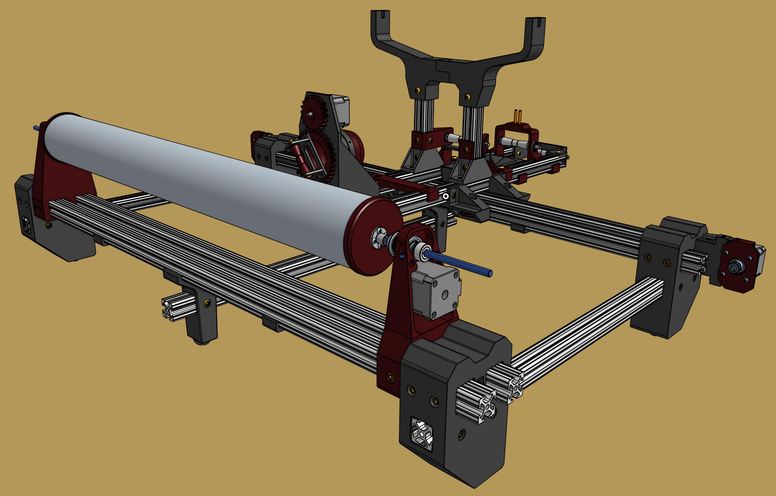
A 3-Axis Composite Filament Winder (CFW) is an CNC machine which can fabricate axisymmetric parts using the controlled deposition of continuous filaments called tow.
Common reinforcement types include carbon fiber, glass, and aramid fibers, with a near limitless selection of matrix choices.

By controlling parameters such as wind angle, geometry and others, a filament winding machine can produce extremely high-performance composite parts at a fraction of the weight and cost of traditional manufacturing methods.

Background

This project builds upon the open-source filament winding machine developed by Andrew Reilley, who created a low-cost and accessible approach to composite manufacturing.
Inspired by this system, Team M1.02 aims to adapt and enhance the design for the Ingram School of Engineering, creating an educational platform that introduces students to affordable composite fabrication.

CAD Model Design



Development

Concept Development → **SOW & Goals** → **CAD Design** → **Parts Ordering** → **Assembly** → **Programming & Calibration** → **Full Resin Wind**

We are here

Future Work

Next: CFRP Winding Campaign & ASTM Standards Characterization

Spring 2026: Improvements to rigidity and implementation of superior control electronics.
Implementation of an industrial winding g-code software for use by students.
Potential Goals: Integration of a 4th axis to enable COPV development.

Action Items

- Redevelop and replace less-rigid components.
- Lengthen carriage travel to accommodate up to 2 meters.
- Addition of a 4th Axis for more complex shapes.
- Integration of industrial filament winding program such as TaniqWind, CADFil, CADwind.
- Development of documentation and SOP for future users.

Meet The Team

Left to right:
Hunter Kelly, Sandy Hernandez, Everest Sweet

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