Mechanical, Aerospace and Manufacturing Engineering Senior Design Job Ticket

Sponsoring Company: Union Bee Company

Project Title: Process to Create Improved Durability Beehive Frame

Prime Contacts: Thomas Bacon unionbeecompany@gmail.com

Project Focus: Design, Woodworking, Tool Design, Very Hands On

The Engineering Challenge: Tom Bacon, former Army Ranger, lifelong carpenter, woodworker, and avid beekeeper, operates The Union Bee Company located in Union CT. They maintain about 100 honey bee colonies, sell honey locally, and offer propolis encouraging hives (a natural resinous mixture produced by honeybees from substances collected from parts of plants, buds, and exudates) which studies suggest improves honey bee colony health.

Hives incorporate multiple wooden frames on which the bees produce the honeycomb, which holds the brood, honey, and pollen, as shown in figure 1.

Figure 1 Beehive Frame

The frames are made of soft pine wood with interlocking joints and are “self-spacing” via the Hoffman end bars, as shown in figure 2. The frames are a commodity that are sold in large numbers throughout the bee keeping community.

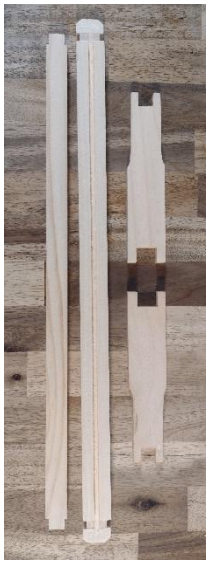


Figure 2 Frame Pieces and Assembled Hoffman Style End Bar

The joints are prone to splitting and breaking during handling. Tom has identified an alternate joint configuration which he has shown, in preliminary testing, to be substantially stronger than the current joint design, however, the new design requires an alternate method of cutting, shaping and tooling to be commercially viable.

Description of Problem/Project: The objective of this project is to identify, develop and demonstrate a process to efficiently create the new joint design.

Expected Deliverables/Approach: Major activities of this project include:

Study the current joint configuration, review the process steps to produce the joint pieces and understand the failure modes.

Review the proposed new joint design and the preliminary testing results.

Identify candidate process steps and necessary tools and fixtures required to fabricate the proposed design.

Fabricate candidate joints and conduct testing to systematically determine the joint durability vs the current joint design.

Select the most promising process and tooling to economically produce the new design.

Conduct time studies and cost analysis as necessary.

Provide all CAD models, tooling, test data, BOM and reports.

- **Is there a specific software package required for the projects? Y ___ N _X__**

  Which package (name/version) _____

- **U.S. Citizen/Person (green card) Required? Y____ N _X___**

- **Will Export Controlled data be used in project (EAR/ITAR) Y _____N_X__**

- **NDA/IP Agreements required? Y _X__ N __**

  - **Other considerations:** Due to current patent status, students will be required to sign NDAs.