Preliminary Design for Modular Insect Rendering Unit

ANU Insect Farming Group

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1 Introduction

Partnering with Canberra Based company Goterra, they specialize in organic waste processing by moving, to location, mobile insect farming plants. These can be installed and allowed to run, breeding Black Soldier Fly Larvae to be processed for their protein and natural oils. Our ANU group seeks to design a similar mobile insect **rendering** plant, to allow on-site processing of the insects, allowing for huge reductions in transport and capital expenditure costs

2 Rendering Process and Design

The below rendering process was decided upon, after discussions with both Goterra, as to what their needs are, general research into the components and the process itself, and finally in-depth discussions with various manufacturers of the various pieces of equipment presented in the design, as well as reworking and making assumptions based on their advice.

2.1 Stakeholder Requirements

The key requirement from Goterra is that the plant is **transportable**. Whether it be transportable along with the mobile farming unit, or sits in a standard location, the unit has to be at a minimum capable of transport when needed. Goterra therefore wants the plant contained within (preferably) a 40 foot container, or if needed a modular design separated into more than one container. With this in mind, we have been able to design a plant, with various assumptions attached, that should be able to fit into 2 containers, one 20 ft, the other 40 ft.

2.2 Assumptions and Preliminary-Design

The unique situation that the project finds itself lends itself to assumptions, as the process and material itself is non standard. Below are the assumptions made before the designing phase took place:

- The rendering process used is similar to fish meal processing.
- The plant is able to process a minimum of 1 ton every 8 hours
- A dry rendering process, electricity is used to heat the material in the continuous cooker.
- Orientation and placement of equipment as indicated in Figure 1 is possible, with entire crate properly ventilated, either through forced convection or removable panelling, offering easy maintenance and natural air flow cooling.
- All components listed can be sourced commercially (their dimensions listed, retrieved from the manufacturers themselves).
- Each larvae has estimated dimensions of 2*1*0.7 cm. We have therefore been advised that no material breaker is needed in the design. The insects can be moved into the cooker as is.
- The only protein/tallow separation equipment piece is an industrial Fat Press.
- A batch cooker, material is "cooked" for 2 hours, then "dried" for 3 hours, where water vapour and other released gasses are pulled through a dust collector, and into a condenser, in order to condense the extracted waste water.
- Dried Material then proceeds into the Fat-Press, where protein meal and tallow (oils) are extracted.
- Cooling tower and water tank are for supplying and storing the water (respectively) that the condenser uses to extract the waste water.

Component	**Length (m)**	**Breadth (m)**	**Height (m)**	**Diameter (m)**
1. Continuous Cooker	4	1.6	1.9	-
2. Screw Conveyor	2.15	0.48	2.15	-
3. Fat press	3.17	1.6	1.72	-
4. Vacuum Pump	2.1	1.32	1.16	-
5. Electricity Equipment	2.5	0.6	1.8	-
6. Dust Collector	0.56	0.56	2	-
7. Condenser	2	-	-	0.8
8. Cooling Tower	-	-	1.5	2
9. Water Tank	2.7	2.2	1.2	-

Table 1: Component Dimensions

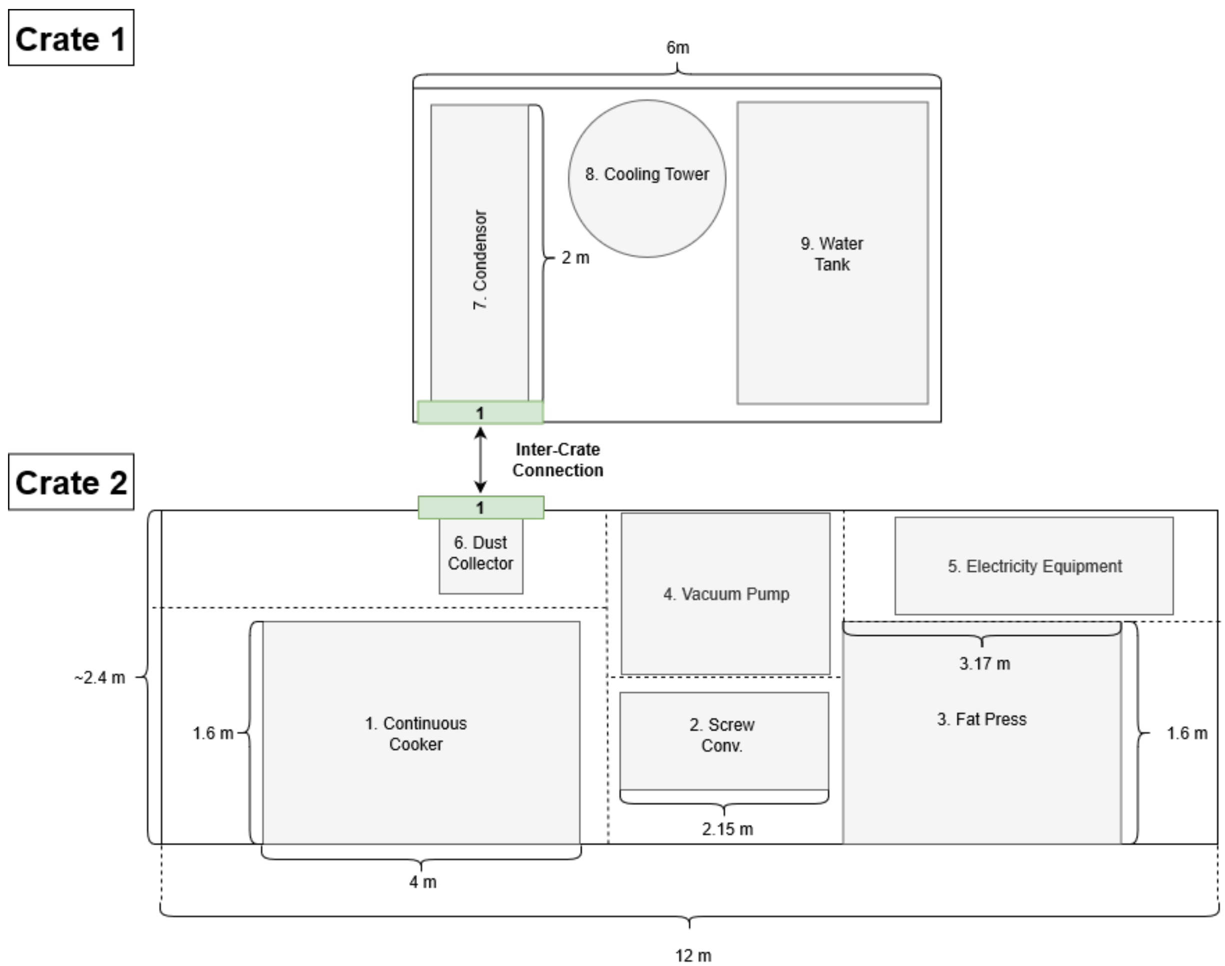

Figure 1: Design Schematic

3 Feedback

First of all thank for your looking at our work. We will make sure to acknowledge your support and advice in the final project submission. What we seek at the moment is simply if the assumptions listed are valid and if the design included in Figure 1 is feasible. Glaring errors or conceptual problems would be invaluable to recognize at this point, hence why we have reached out to industry experts in the field, to try and validate (as far as possible) the feasibility of the design.