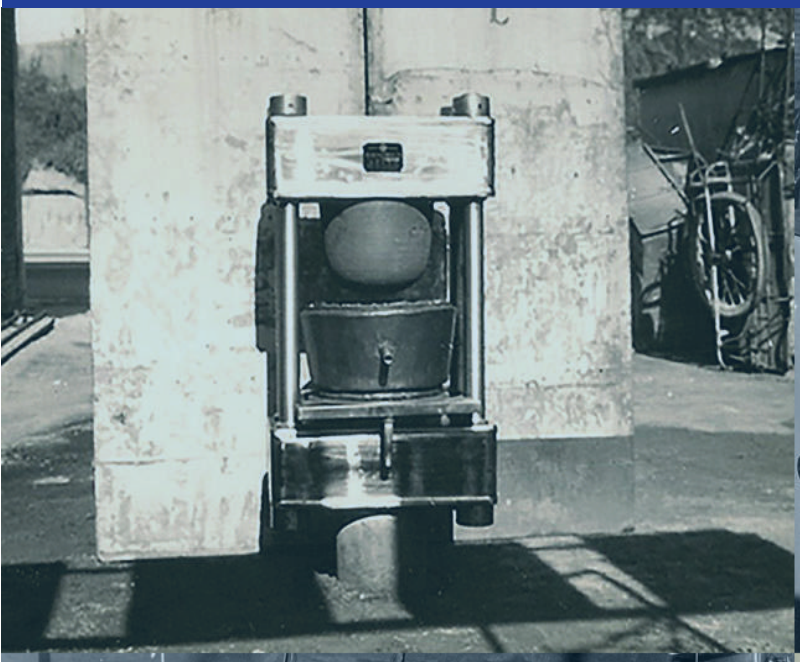
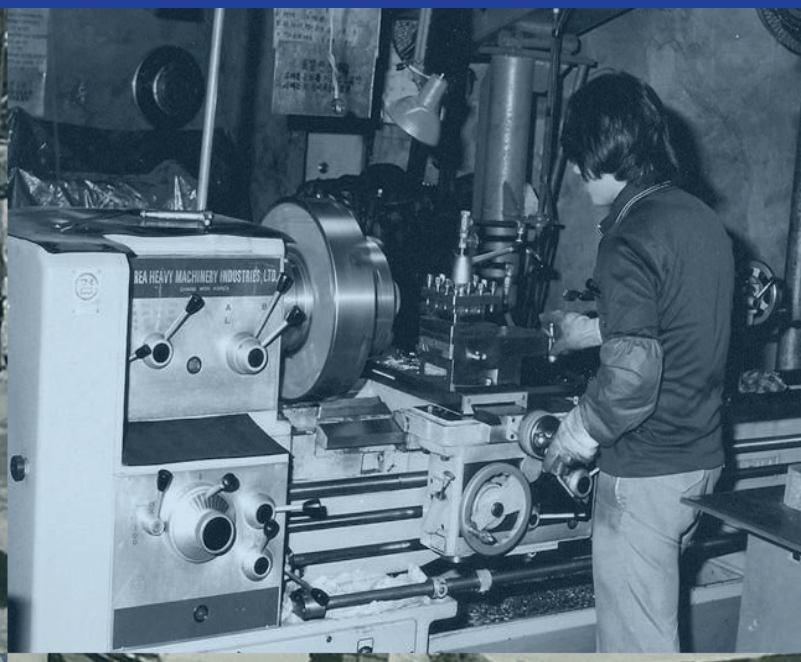
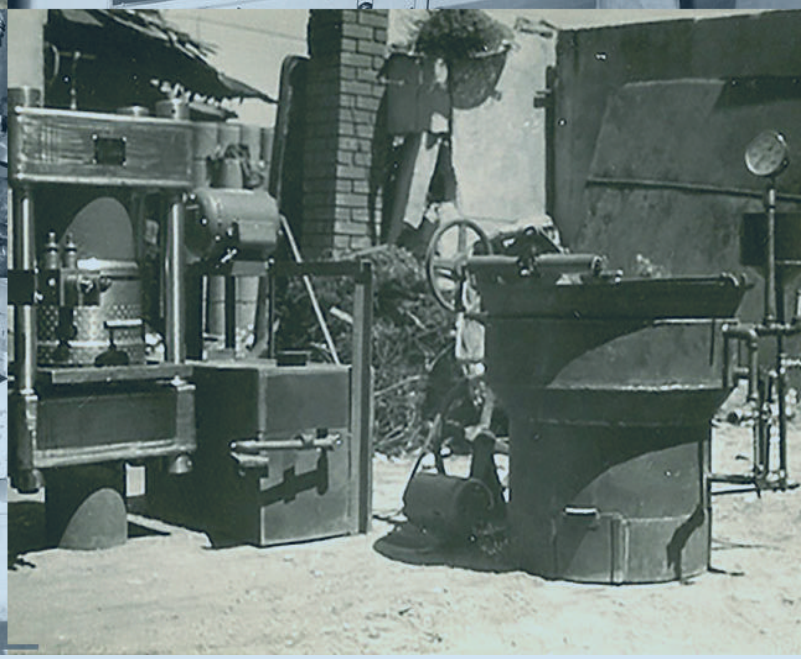






GOTERRA

Australian National University

MOBILE INSECT REDNDERING PLANT

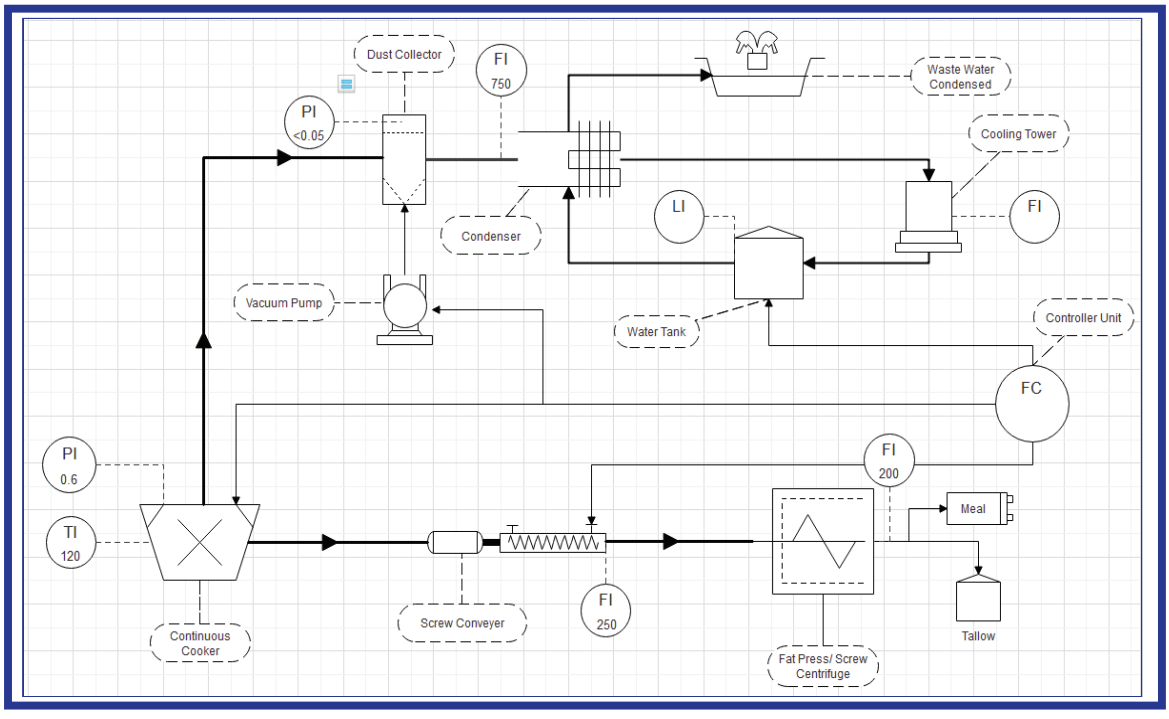
PROJECT

SCOPE MOTIVATION

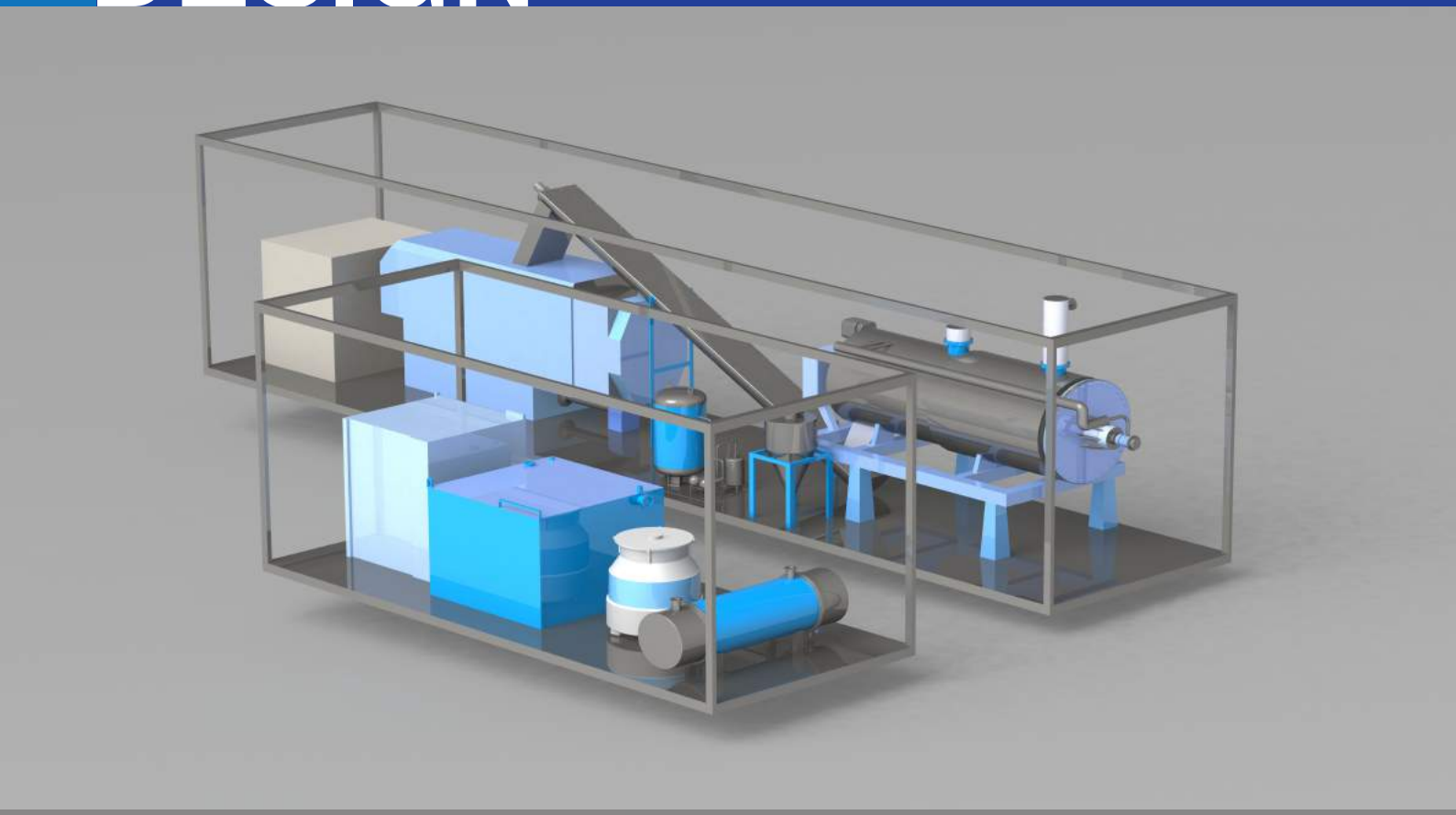
Every business produces waste, whether it be organic or industrial. With the world population ever increasing, along with its thirst for resources, Goterra seeks to transform common organic waste into high value protein and oils through the use of breeding Black Soldier Fly Larvae. By utilizing mobile insect breeding plants, transporting them to areas where there is high organic waste output, Goterra allows on site production of larvae, eliminating the need for material transportation or infrastructure. The project our team has been tasked is to conduct feasibility analysis and design of a mobile insect rendering plant that contained in one (or more) containers can accompany the mobile farming plant from site to site.

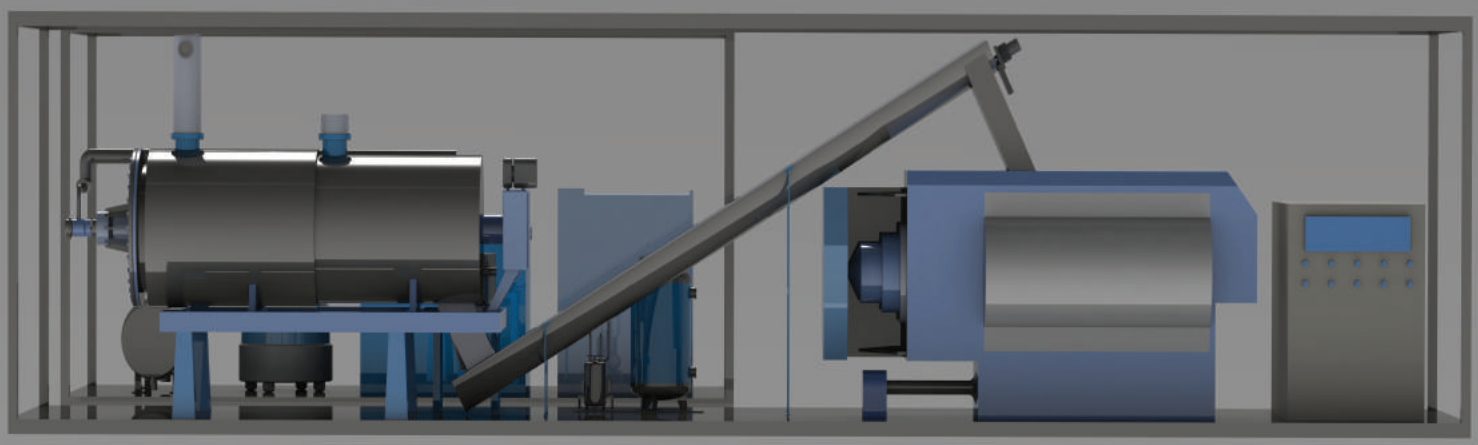
SYSTEM INTRODUCTION

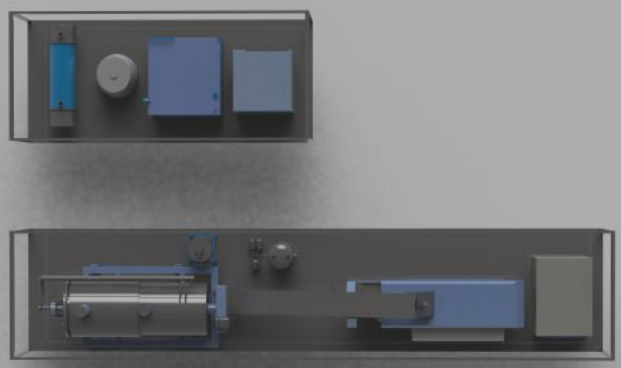
1. Insects move into Continuous Cooker
2. Cooked for 2 hours, then dried for 3 hours, vapour is extracted into Dust Collector, and meal into Fat Press (through screw conveyer)
3. Fat Press separates Meal from liquid tallow, both of which is then ejected into outside storage
4. Dust Collector removes any solids from the vapour, which is then condensed in the Condenser.
5. Waste water pumped outside, stored before treated further.
6. Cooling tower and Water tanks used in the Condensing process
7. Overall construction cost of the system is approximatly $15400 and the running cost every 8 hrs is approximatly $195.

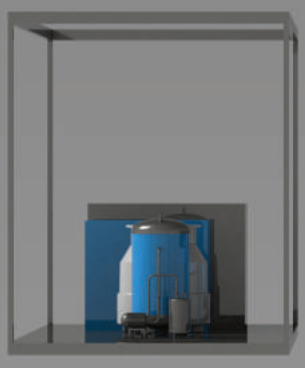


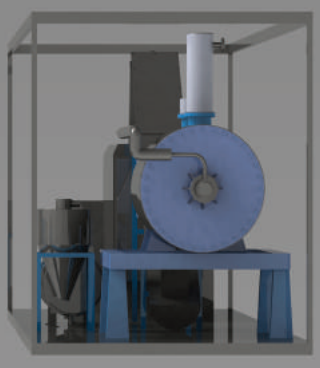
DESIGN

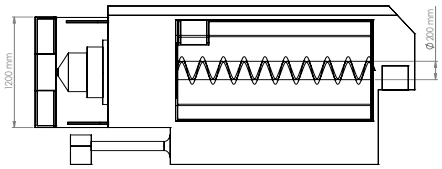


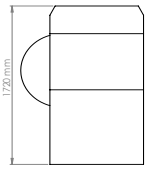


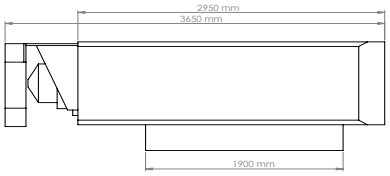


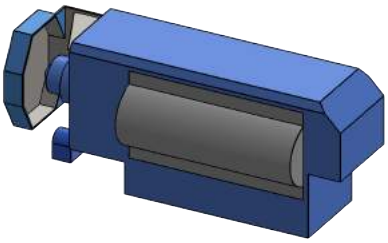












Fat Press

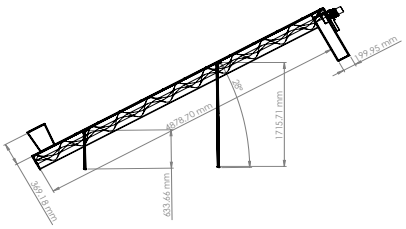
Once the material has been cooked and dried, it is moved through the conveyer into the fat press, where through a rotational device (as shown to the left) forces the solids from the liquid tallow, and then ejecting the two quantities separately.

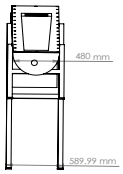
Material: Carbon steel
Power: 15kW
Throughput: 200kg/h
Cost: $15300

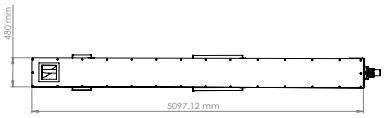
Screw Covenyor

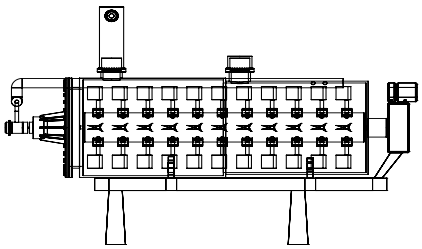
Meant for transporting the cooked material from the cooker to Fat Press.

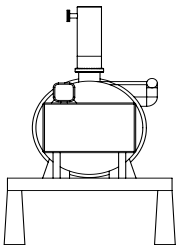
Material: Carbon steel
Power: 2.2kW
Cost: $7000

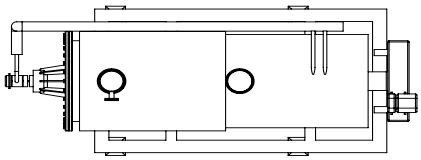


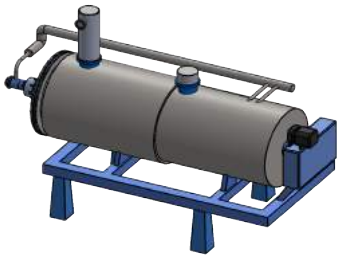












Batch Cooker

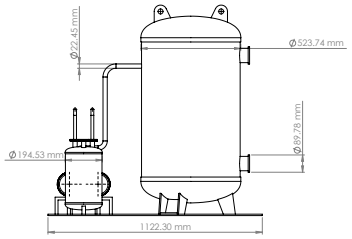
The term “batch cooker” refers to the process by which the cooker processes the material. Cooked in batches, for a period to releases all water contained in the larvae, and then dried for another period to remove it, the material is the n transported out of it, dehydrated and ready to be further processed.

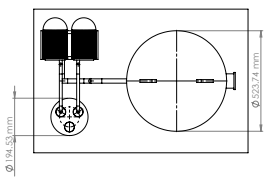
Material: Carbon steel
Power: 5.5kW
Pressure: 1MPa (max) 0.6MPa (working)
Temperture: 120-140 degree
Cost: $32300

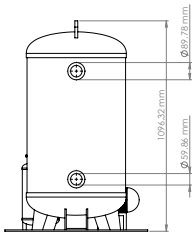
Vacuum pump

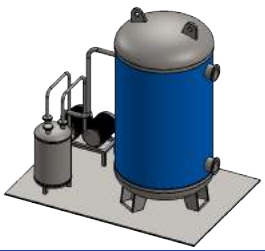
Meant for transporting the cooked material from the cooker to Fat Press.

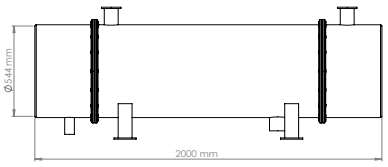
Material: Carbon steel
Power: 6.2kW
Pressure: Adjustable
Cost: $13000

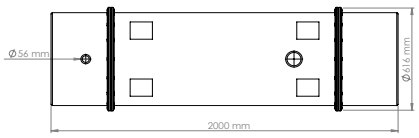


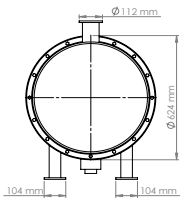


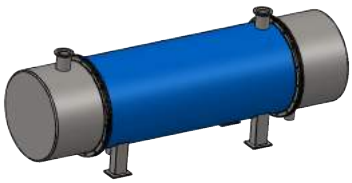












Condenser

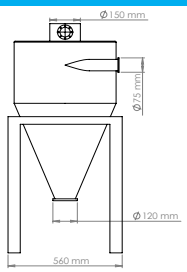
Used to cool the removed vapor from the cooker into waste water that is removed at the end, and stored for further processing.

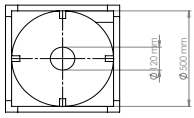
Material: Carbon steel
Power: 7.5kW
Pressure: Depends on vacuum pump
Cost: $11000

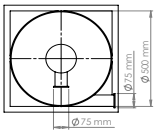
Dust Collector

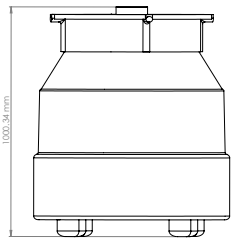
Removes solid particles from the vapor, as well as other impurities.

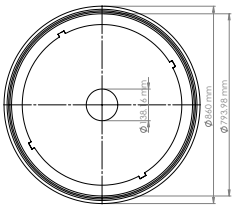
Material: Stainless steel
Power: 5.5kW
Interal pressure reduced: <0.05MPa
Collection efficiency: >90%
Cost: $5000

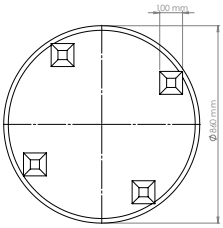


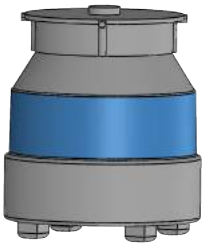












Cooling Tower

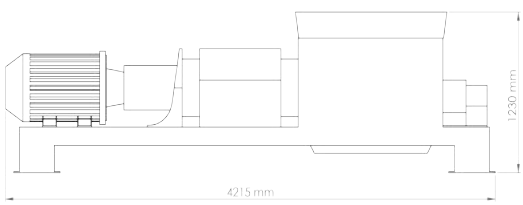
Cools water used by the condenser in the condensing process (not the waste water that condenses from the vapor from the cooker)

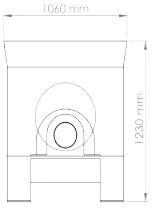
Material: Carbon steel
Power: 0.75kW
Capacity: 30 tons/hr
Cost: $290

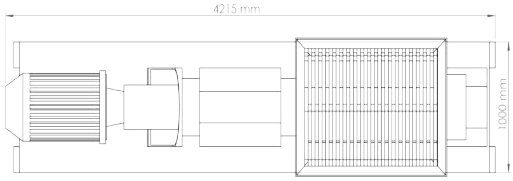
Breaker

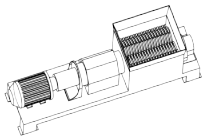
Breaker is not used in the designed insect rendering system since the insects are small enough. The breaker is designed to break the larger livestocks into little pieces as one of the pre-processing procedures.

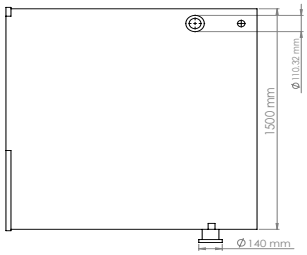
Cost: $28000

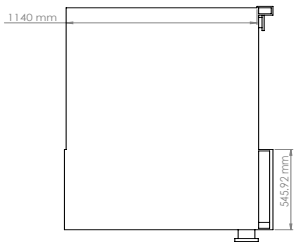


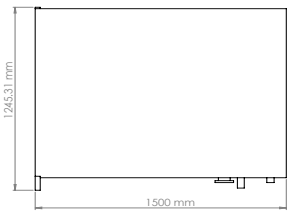


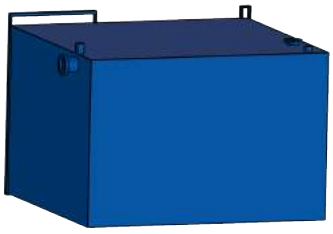












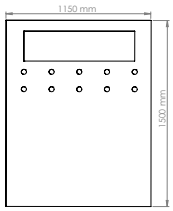
Water Tank

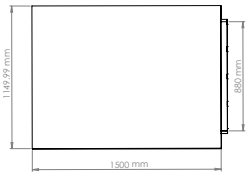
As a part of cooling system, it is used to store and cool down the water. Cool water will be pumped into condenser to absorb the heat.

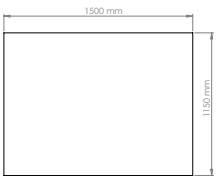
Material: Fibre-reinforced plastic
Capacity: 2.9 cube meters
Cost: $375

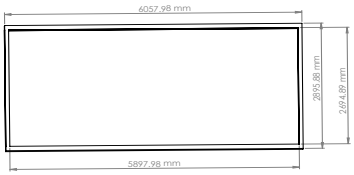
Controller

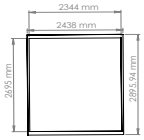
Control the overall rendering system by using PLC control system to realise the whole system automation.











20 Feet HQ Container

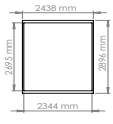
The standard shipping container that is openable on five sides during operations and at the same time, it achieves the standard transporting requirements. The equipment will be fixed in the containers.

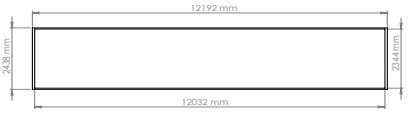
Material: Corten steel
Max load: 25 tons
Tare weight: 2130 kg
Cost: $9000

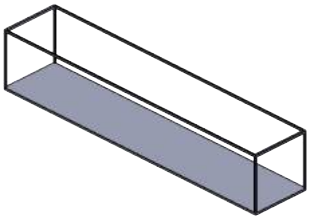
40 Feet HQ Container

The standard shipping container that is openable on five sides during operations and at the same time, it achieves the standard transporting requirements. The equipment will be fixed in the containers.

Material: Corten steel
Max load: 26.46 tons
Tare weight: 3660 kg
Cost: $13000





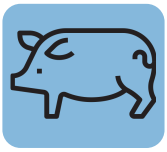


IMPACT

Addresses Barrier to Market
Low Capital Expenditure enables players to enter market

Generates High Value Products
Widely usable protein meal and oils from low value waste

Environmentally Sustainable
Significantly more efficient than current agricultural practices



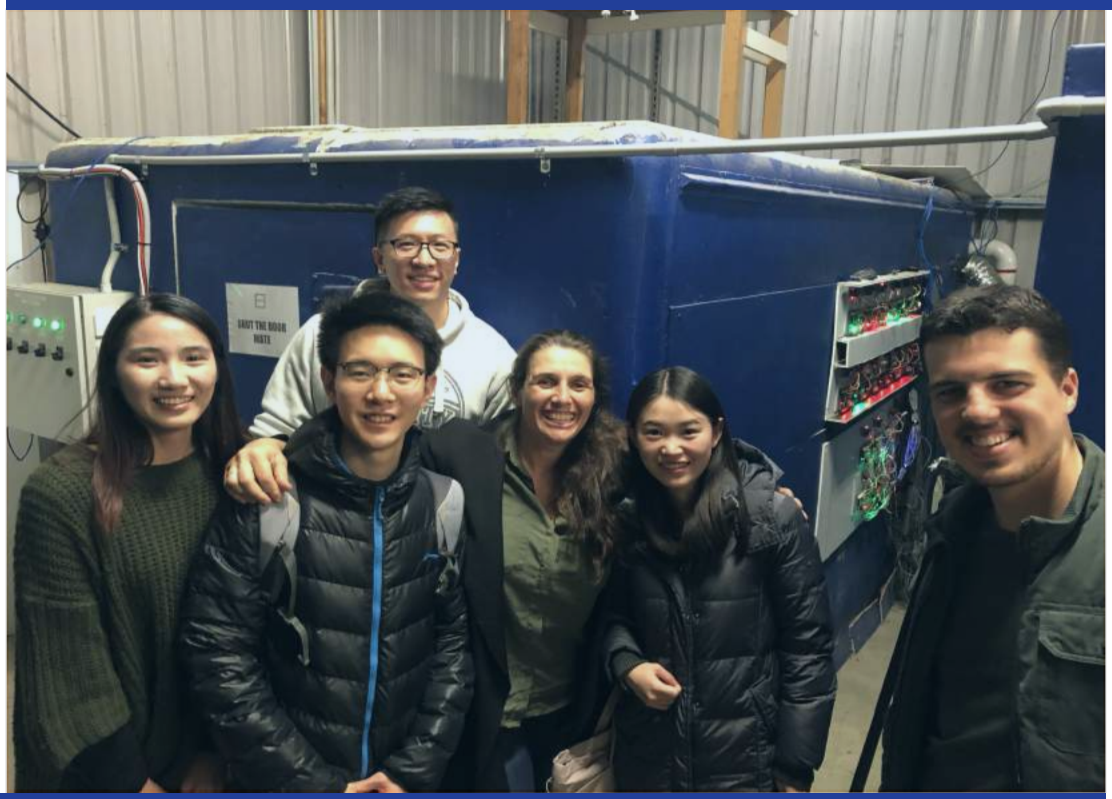
Popularizes Insect Protein as a Food Source
Helping increase production, insect protein becomes normalized

THE FUTURE

1. **Expanding Rendering into Other Animal Materials**
While currently able to process insects only, future projects will seek to expand the designs capability to process animal offal and fish.

2. **Redesigning Process Equipment**
Currently most of the equipment sourced for the design is over capacity. As this project is continued, specific equipment can be design ed to be smaller and more efficient for Goterra.

3. **Increasing Synergy between Farming and Rendering Modules**
Can waste heat from rendering be used in the farming module? Is the waste water extracted of any value in the rest of the process? These questions and others will be sough to be answered.



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