The agricultural industry needs greenhouse products that allow crops to be grown in an energy efficient manner due to climate change, increasing energy demands, and high fuels prices.

**Market**
- Farms seeking renewable energy
- 282,000 greenhouses in US

**Customer Requirements**
- Heat greenhouse to growing temperatures
- Minimize cost, size, labor
- Energy source is off-grid and renewable

**Constraints**
- Internal 150°F
- Max size 400 sq ft

**CTQ Engineering Characteristics**
- CO₂ to N ratio
- Safety / Ease of use
- Pollutant wastes
- Optimal Flow rate
- Heat 1700 sq ft to 70-75°F

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**CoHeat Design**

CoHeat operates on compost. By pumping water through polymer coils inside the compost drum, the heat generated by the bacteria breaking down the compost can be transported and used for heating other spaces.

- Off-grid
- Renewable energy
- Low cost
- Simple to operate

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**Prototype and Testing**

Prototype shows an approximation of how the consumer grade CoHeat compost drum would look. It includes the prototype of the parallel coil system and header as well as the prototype swivel join interface for connecting the CoHeat compost drum to a pump system.

- Testing is designed to measure total heat output from the compost drum.
- Control experiment done with a known heat source first (shown right) then repeated with compost.

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**Test Results and Future Work**

- HOQ was vital in identifying the engineering characteristics
- Prototype testing significantly improved original design.

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**Process Reflection**
- Automated composting system
- Suitable plastic drum

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**Future Work**
- Automated composting system
- Suitable plastic drum