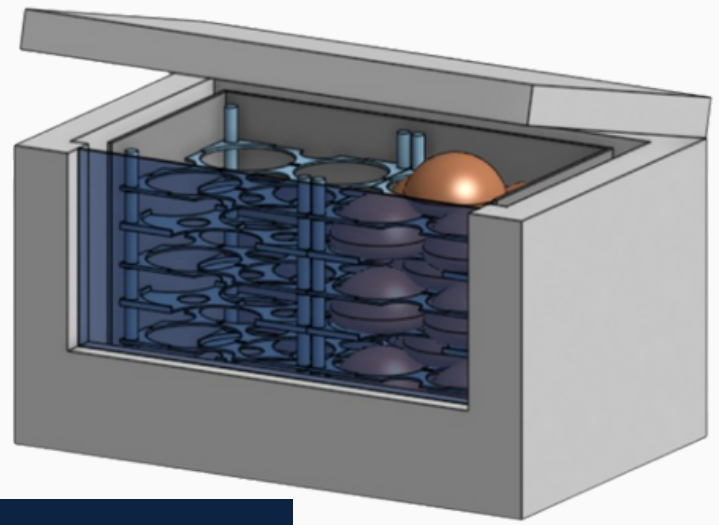


# MUSHROOM ENVIRONMENT CONTROLLED CONTAINER (MECC)



## Description

MECC is a container tailored specifically for the transportation of mushrooms from Noki Farms to the Farmer's Market events within Downtown Toronto.

## Opportunity

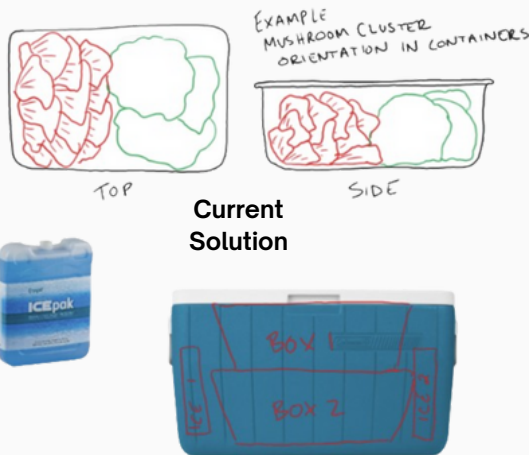
Maximizing the spatial usage for mushroom storage during transportation and relative environment preservation while minimizing bruising/physical damages for Noki Farm community.

## Concept

Dual layer container with an insulative outer shell to prevent heat transfer and inner layer to promote cooling. Trays to pack, support, and prevent damage for mushrooms through interstitial stacking sequence.

## Why Is This Needed?

- Only **25.8%** of total volume is used as there are large gaps between the ice, mushrooms, and walls.
- Vertical and horizontal contact between mushrooms leads to possible bruising.
- Ice packs are used to create optimal environment in a container-within-container structure which is not spatially efficient; only **51.6%** of empty space.
- The current solution is unable to **display** the mushrooms while inside of the cooling container.



## Objectives

### Spatial Optimization

- Ensure it fits inside of the vehicle.
- maximize the amount of mushrooms that can fit.

### Mushroom Health

- Maintain original temperature and humidity ranges.
- No physical damages and bruising of mushrooms.

### Durability

- Maintain integrity of the mushrooms within during transportation or handling.

### Safety

- Light enough to carry from the car to the market.

# Design Features and Justifications



Insulative Outer Layer

Styrofoam is a good heat insulator which reduces the rate of leakage of temperature inside the container so that the mushroom can be maintained at ideal temperature for a longer time period.



Hinges

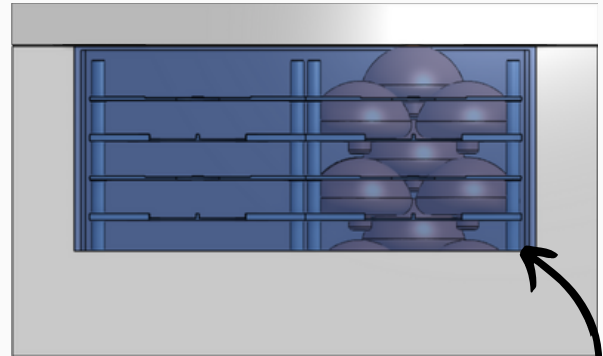
Easy access to the container whenever a mushroom needs to be handled.

## Servo and Temperature / Humidity Sensor

If the conditions within the container are suboptimal for mushroom preservation, the servo opens a portion of the lid to let in warmer air.

## Built-in Inner Cooling Layer and Temperature / Humidity Sensor

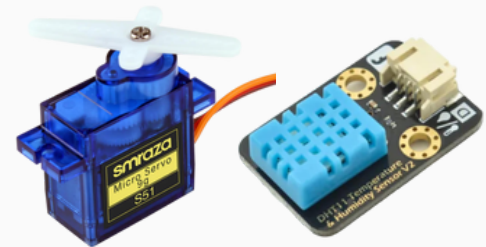
The surface area of cooling is maximized in order to increase cooling rate.



Interstitial Stacking Trays and Transparent Acrylic Display

Packs the mushrooms into a uniform order which increases the spatial utilization of mushrooms by **23%** compared to the original design. Also, supported racks prevent mushroom from bruising by eliminating vertical contact forces.

The acrylic display allows for mushrooms to be displayed while keeping optimal conditions, which is a current issue.

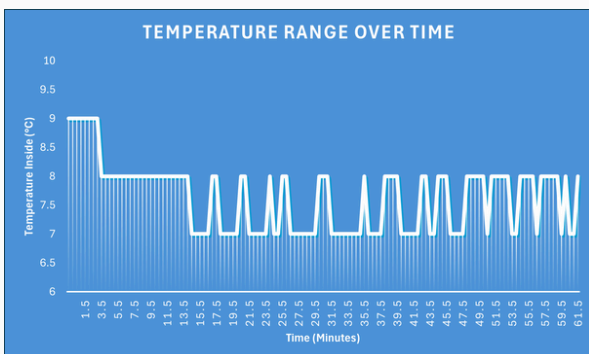


# Evaluation

## Temperature Control Mechanism

Shown to the left is a graph produced over the span of 1 hour with the temperature maintained at **7 - 9°C**.

As the ice inside continues to cool the container, the temperature control mechanism is able to continuously let in warmer air to maintain the temperature range.



- Maintaining a specified **temperature range** without human interaction.
- **7.1x** larger cooling area than the existing design.

- **1.89x** more mushrooms can be stored compared to the original solution.
- **78%** lighter than the existing design.