Automated Mycelium Inoculator

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SEACOAST MUSHROOMS
MYSTIC, CT

Problem & Motivation

- Disconnect between large-scale, expensive proprietary equipment and home-grower solutions
- High contamination rates of human dosing
- Repeatability struggles of precise dosing for different varieties

Sterility

- Maintaining sterility is the paramount constraint for the project to minimize competition between the target mushroom species and other micro-organisms in the medium bag.
- Necessitates that the designed mechanism never contact the contents of either the spawn bag or the medium bag.
  - Operation manipulates the exterior of the bags, not the spawn itself.

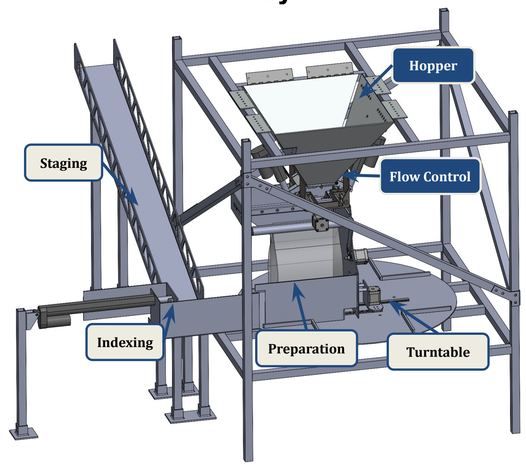
User-Centered Design

- Collaborated with mushroom farmer
- Iterated through multiple system versions
- Refined design based on real-world workflow needs
- Focused on usability and integration

Bag Preparation Module

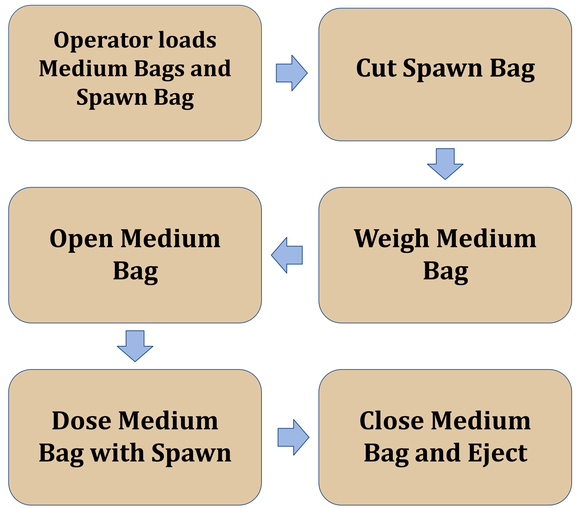
This module utilizes two plena, one on a linear rack and pinion, and one on a pivot, to open the bags of medium. Each plenum has two suction cups, and is connected to it's own vacuum pump.

Final System

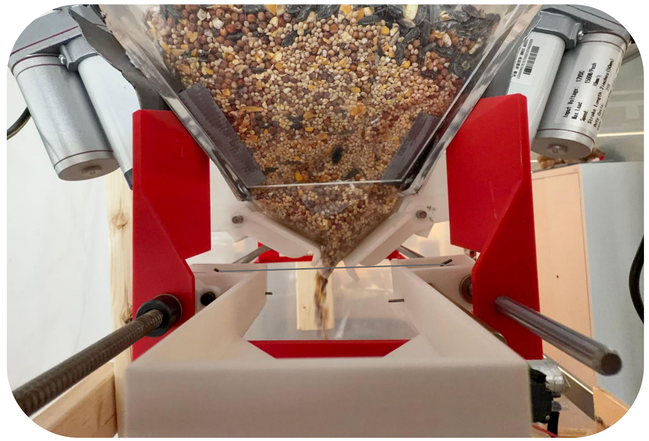


The overall installation includes a staging and indexing mechanism for bags of medium, and mounts the bag preparation module on a turntable beneath the hopper. This motion facilitates integration with existing stages of automation.

Operational Procedure

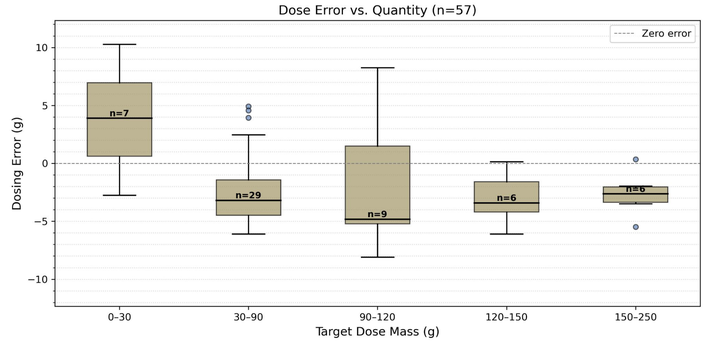


Flow Control Module



This module contains flaps for flow control and a hot wire to cut a hole. Two linear actuators provide controlled motion to crimp, seal, and manipulate the corner of the spawn bag. An electrically heated nichrome wire traverses through the corner to sterilely open the spawn bag. Feedback from a scale adjusts the flow rate through the position of the flaps.

Results



Under repeated testing across ranges of dose sizing and spawn bag volume, the system reliably dosed with an error within 5 grams of the target. This is well within the target accuracy of <10 grams. Testing included several outliers, the causes of which were determined to be outside the scope of normal operation.