

FilaMint

Requirements

Group 4

ECE 411
Version 2.0

Need

Filament is often improperly stored, which exposes the material to moisture. This exposure to moisture deteriorates the quality of the filament, therefore deteriorating the quality of the user's print job. Additionally, printers normally will tell you how much filament has been used, but there is usually no way for the printer to measure how much filament is remaining on the spool. Both these issues lead to printing failures. There had to be a solution to fix these common issues for 3D printing enthusiasts. Because this market is starting to become affordable to all, FilaMint was created to become the affordable solution.

Objective

The objective is to create an inexpensive device that will alert the customer if the storage humidity level is too high as well as when the filament is running low. The system must monitor humidity, alert user if humidity is too high, securely store filament in the enclosed and sealed container, and estimate how much filament is remaining.

Background

A simple google search has shown that there have been similar designs that were created to prevent humidity from getting into the filament, but none that incorporate humidity and weight measurements in the same design. Some designs used a modified 'air tight storage tote' or a large ziplock bag that was then vacuum sealed. These designs were very low cost but didn't alarm when humidity levels were too high. Some more expensive designs (\$150+) looked like a modified desiccator oven that fits filament spools and it was able to regenerate desiccant packs, but this design did not monitor humidity levels or alarms. None of these designs measured the weight of the filament either.

Requirements

Functionality

- System must detect humidity within the container and alert the user if humidity is too high
- System must measure weight of the filament and alert the user if the filament is too low
- System must have an interface so the user can select type of filament they are storing
- The container must be sealed in order to reduce humidity

Performance

- The weight measurement accuracy must be within 1 gram at all times
- The humidity sensor accuracy must be within 5% at all times
- The container must be able to store at least one spool of filament
- Information must be visible within 5 seconds when prompted

Manufacturability

- The system must be manufactured on a circuit board with linear dimensions no less than 2cm and not greater than 30cm
- The system must be manufactured using two-layer printed circuit board technology

Operational

- The system must be able to be able to operate in typical indoor environments (non-extreme).
- Must be used on a flat surface

Economic

- Unit cost of less than \$150
- Affordable unit
- The only maintenance cost must be the replacement of batteries.
- Must maintain silica beads

Energy

- Must have replaceable power supply
- Supply must last a minimum of a month on standby

Health & Safety

- Must not explode
- Must not emit unhealthy amounts of radiation
- System must not exceed ten pounds

Legal

- Non-infringing patents and copyrights

Environmental

- At least 50% of the components will be recyclable

Maintainability

- User maintainable
- Product hardware components can be bought from at least 2 vendors

Reliability & Availability

- MTTF 5 years

Social & Cultural

- Must be easy to use and maintain by technical and non-technical users
- Intuitive and self-explaining

Usability

- No on-site or user customization necessary or programming
- No longer than 30 minutes to learn how to use product
- Straightforward user interface with no more than 5 levels of menu options

Documentation

- Instructions on the side explaining how to replace or recharge silica beads
- Instructions on how to use product