<EQUINE DEVICE>

PRODUCT DESIGN SPECIFICATION

Version *<1.0>*

<02/25/2018>

VERSION HISTORY

*[Provide information on how the development and distribution of the **Product Design Specification**, up to the final point of approval, was controlled and tracked. Use the table below to provide the version number, the author implementing the version, the date of the version, the name of the person approving the version, the date that particular version was approved, and a brief description of the reason for creating the revised version.]*

Version #	Implemented By	Revision Date	Approved By	Approval Date	Reason
1.0	*Christopher Moskovitz*	*02/25/2018*	*Christopher Moskoivtz*	*02/12/2018*	Initial Design Definition draft

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Introduction

1.1 Purpose of The Product Design Specification Document

The purpose of this document is to provide an overview of the features and qualities the device should have. The goal of this requirement specification is to great a collection of requirements that this device should meet. It should help in the building in the final design specification.

2. General Overview and Design Guidelines/Approach

In order for this device to work indoors the device should nearly mimic the internal design pictured in Fig.P 0.0. The modifications to this device is to incorporate heating elements in order for the salt to remain dry in outdoor weather conditions. When salt has become wet heating it to 80 degrees celsius will dry it. 40-50 degrees celsius temperature we would like for the metal non-ferrous metal or stainless steel parts to reach. It is important for this “humidity removal process to be as fast as possible.

There are key 5 components in this device's design that should be expanded on.

1. Physical Appeal
2. Robustness
    a. User Warnenty is 2 years but device should have an expected lifetime of 5 years.
3. User Interface
4. Maintenance
5. Safety During Operation
    a. No risk of injury for user or patient.

2.1 Assumptions / Constraints / Standards

A technical file must be built in order to show that the device complies. The technical file will contain several thing such as reports and declarations of conformity (DoC) from supplies/manufactures.

Low Voltage Directive

EMC Directive

RoHS Directive

The there are two tests that will be conducted to see if the device complies to the standards are the EMC and Low Voltage tests. The EMC test will be done by an EMC laboratory. The low voltage test can also be done by the laboratory but the alternative is for your engineers to do this in house with the necessary equipment. This is specified in the standards.

It was determined that the following European harmonised standards apply to our Equine Device:

Electrical Safety (Low Voltage Directive):

This is the product standard that we have found to be most applicable considering the intended purpose, but we realise the product is not exactly an air-cleaning appliance:

• EN-IEC 60335-2-65 Household and similar electrical appliances - Safety -- Part 2-65:

Particular requirements for air-cleaning appliances

And you can also fall back on the following standard:

• EN-IEC 60335-1 Safety of household and similar electrical appliances - Part 1: General requirements

EMC:

• EN 55014-1:2006 + A2:2011 Electromagnetic compatibility - Requirements for household

appliances, electric tools and similar apparatus - Part 1: Emission (CISPR 14-

1:2005/A2:2011)

• EN 55014-2:1997 Electromagnetic compatibility - Requirements for household

appliances, electric tools and similar apparatus - Part 2: Immunity - Product family

standard

• EN 55014-2:1997/A1:2001 Electromagnetic compatibility - Requirements for household

appliances, electric tools and similar apparatus - Part 2: Immunity - Product family

standard

• EN 55014-2:1997/A2:2008 Electromagnetic compatibility - Requirements for household

appliances, electric tools and similar apparatus - Part 2: Immunity - Product family

standard

RoHS:

• EN 50581:2012 - Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Internal Architecture Design

This section outlines the system and hardware architecture design of the system that is being built.

Non-ferrous/ Stainless steel metal parts:

- Funnel/ feeder entrance. 2.5cm x 2.5cm **Fig.P 4.0**
- Drop tube **Fig.B 5.1**
- Round internal body Internal body **Fig.P 5.1**
- Mill base. **Fig.P 2.0**
- Blades **Fig.P 2.0**

Plastic Parts

- Feeder **Fig.P 4.3**
- Mill encasing **Fig.P 2.3**

Plastic or Metal

- Extension sleeve and exit tube **Fig.P 2.3, Fig.C 6.1**

- Device Placement Environment
  - INDOOR
    - Mounted - Mount that would work as a cable holder as well. Easy way to place device. Plugs and door are orientated appropriately. No heating components near surface that is next to the wall. Grip area to lift device.
    - Dirt -Wet surfaces -shavings- Straw
  - OUTDOOR
    - Mounted - Mount with protective cover
    - Straw
    - Dirt -Wet surfaces -shavings- Straw

- Stand
  - Rubber legs/grip
    - 2-3 cm long
  - Wide surface bottom
    - ~5cm diameter
  - Removable

- Door
  - Magnetic latch
  - No grip to pull open. Hole to pry open. **Fig.B 1.2**
  - Can be opened from left to right or right to left
  - Sensor to detect when door is open

- The device is often in a horizontal position when being stored.
  - All internal parts should be firmly held in the device. The device should be able to be stored in any orientation. Any sudden movements should not risk the device being damaged.

- All components should be protected by the harmful effects of oxidation.
    - Salt is deposited inside the device while working. Salt is a corrosive substance. Corrosion can occur and damage some parts of the device.

- A storage area or attachable storage compartment for accessories.
    - 200ml Spray bottle, paper towel, brushes, salt container, extension cord.
    - The size and occupation of the parts in the device should be minimized in order to provide a space to store items.
    - The storage area should be thermally insulated and not exposed to salt particles
    - Minimum Height : 12cm

- The device should be mountable on a wall.
    - The device should be easy to remove when mounted but should be very secure

- All parts need to be shielded from humidity, weather conditions and the corrosion effects of salt .

- Robust plug-in connections.
    - We would like for there not to be a risk of wires being damaged or pulled. This is important for when the user is removing parts to clean.
    - Should be water and dust proof.
    - Easy connection and easy to access (reachable).

- The device should be able to run on the from the mains power supply consistent with the EU's and USA's.

- Parts should be easily replaceable.
    - "Electronics Box" should be easily removed and replaced all at once.

- Parts should be able to be easily cleaned for maintenance. Process should be well through.

- Feeder **Fig.B 3.0**
    - Made of plastic
    - Cover for the top of the feeder
    - Funnel/Entrance should be made out of a non-ferrous metal or stainless steel
    - Feeding mechanism
        - According to **Fig.B 3.3**. A screw feeder.
    - Screw should made of stainless or plastic
        - In case of stainless steel, a standard sized tube surrounding screw.

    - Feeder entrance/Funnel
        - Should be heated to the required temperature.
        - Made of non-ferrous/stainless metal

- Mill
    - Magnetic attachment
    - 12v Brushless Motor - Should be very robust
    - Quiet
    - Can be cleaned easily
    - Motor and Mill one piece but motor can be easily replaced.
    - Mill can be removed and cleaned but no wires attached.
    - Metal non-ferrous metal or stainless steel plate as a base.
    - Motor remains cool when the device is heated.

- Drop tube
    - Drop tube should be made out of non-ferrous metal or stainless steel.
    - Should have a fixed diameter that connects directly to feeder exit **Fig.B 5.0-5.1**

- Internal body
    - Should be made a rust proof material such as stainless steel that will not corrode or rust.
    - Should be easy to clean and clear of salt using a brush.
    - Heated using convection and conduction.-The circulation of air and the heat conductivity of the body.

- Heaters - to heat all metal parts and parts exposed to salt. 45 degrees within a minimum of 2 minutes. Every hearts has a fan in the proximity to help with convection (air circulation)
    - Heater to heat the entrance of the feeder.
    - Heater to heat the internal body connected to main ventilation fan.
    - Heater to heat the internal body from the outside.

- Electronics protection and ease of replacement.

- Fan
    - Adjustable fan speed
    - Robust

- Screen placement
    - Placed for user to view well.
    - Main screen that can modify every all settings and outputs all information is on the opposite side as the exit tube. Color.
    - Smaller screen with only the ability to show the timer and errors that may be occuring. Monochrome

- Screen Design
    - Frame
        - Designed for water not to flow onto screen
    - Indented into the device 6.0 mm. For protection.
    - Screen must be protected and water resistant. It is often in dusty conditions this must also be kept into consideration.
    - Placed at the centre like the breeze tronic pro. **Fig.B 1.0**
    - Easily replaceable screen **Fig.B 1.0**

External Architecture Design

Body Architecture

- External dimensions: Height: 49.2cm ; Depth: 27cm; Width: 26cm
    - Subject to change for the storage space.
- Weight: Maximum 9.0 kg

Software Architecture

- Visual Feature Icons should be able to be included.
- Warnings should be presented on the display relevant to the error.
- Different treatment session settings should be able to be modified with a private key .
    - Time, fan speed, Approximate particle concentration. Heater temperatures.
    - dispensed salt may be adjusted from 0 to 100% of the capacity separately for each time interval during a treatment.
- Mill on or off during treatment can be set.
- Database
    - How many treatments have been made(cycles)
    - How long the device has been running.
- Display outside temperature and humidity

Safety Architecture

- The device should not produce a loud noise. This would be unsafe for a user when in the company of equine. Outside of device max 70 db.

Automatic mechanisms should be put in place for the system to halt and provide relevant warnings;

Examples Include:

- Fire Hazard.
- Device tipping over.
- Over filling the mill. Mill is blocked
- Door Open.
- Misplaced Wire Connections
- Feeder is blocked
- Fuse is is blown depending on component

Control System

- Outside temperature is monitored.
- Device is heated to the required temperature.
- Ventilation fan-heater temperature depends on outside temperature
- Ventilation fan-heater is constantly on.
- Mill is always running and feeder feeds salt as necessary.
- Thermocouples for: internal body, funnel/feeder entrance.
- Temperatures of all of the heaters.
- Sensor if the device falls over. Device should not run if the device is not on an even enough surface.

Performance

The device should be able to run at 100% performance for a minimum of 10 hours.

Consistently producing particles of 0.5 microns or less.

System Design

Database Design

A Database of trainers and number of treatments carried should be kept.

Everything should be very visual with very little text to read. Audio outputs may be desirable.

Touch display is an option but physical buttons must be able to allow for full use of the device.

PRODUCT DESIGN SPECIFICATION APPROVAL

The undersigned acknowledge they have reviewed the *Equine Device* **Product Design Specification** document and agree with the approach it presents. Any changes to this Requirements Definition will be coordinated with and approved by the undersigned or their designated representatives.

Signature:	_____	Date:	_____
Print Name:	_____		
Title:	_____		
Role:	_____		

Signature:	_____	Date:	_____
Print Name:	_____		
Title:	_____		
Role:	_____		

Appendix A: References

The following table summarizes the documents referenced in this document.

Document Name and Version	Description	Location
<Document Name and Version Number>	*[Provide description of the document]*	*<URL or Network path where document is located>*

Appendix B: Key Terms

The following table provides definitions for terms relevant to this document.

Term	Definition
[Insert Term]	*[Provide definition of the term used in this document.]*
[Insert Term]	*[Provide definition of the term used in this document.]*
[Insert Term]	*[Provide definition of the term used in this document.]*

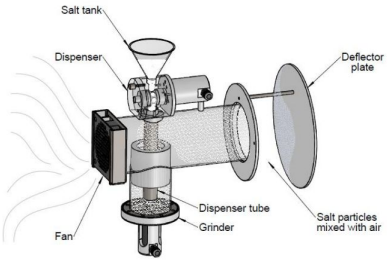
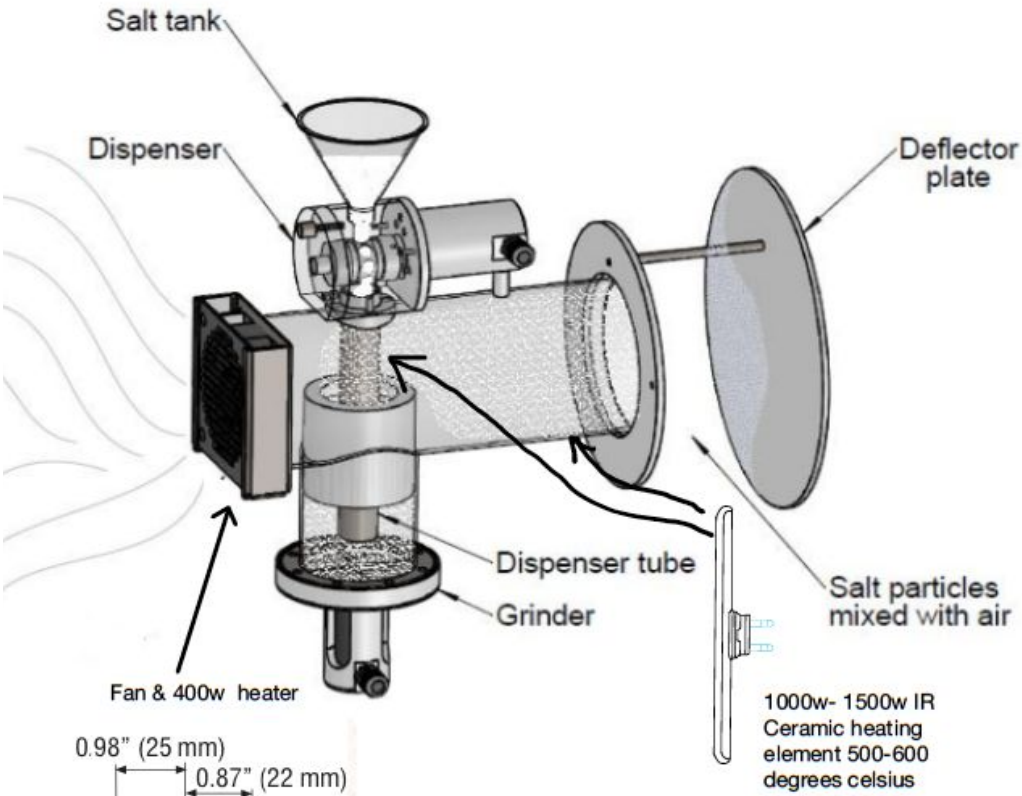


Fig.P 0.0



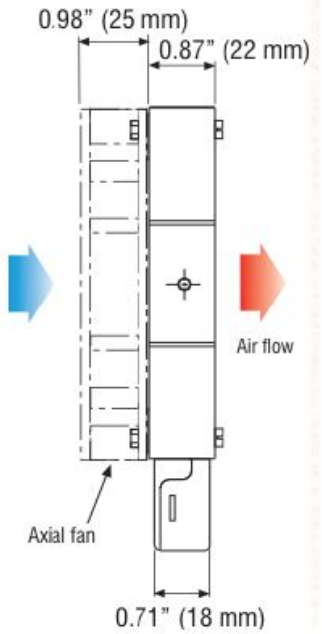


Fig.P 0.1

Fig. B 1.0

Fig.B 1.1

Fig.B1.2

Fig. B 1.3

Fig B. 1.4

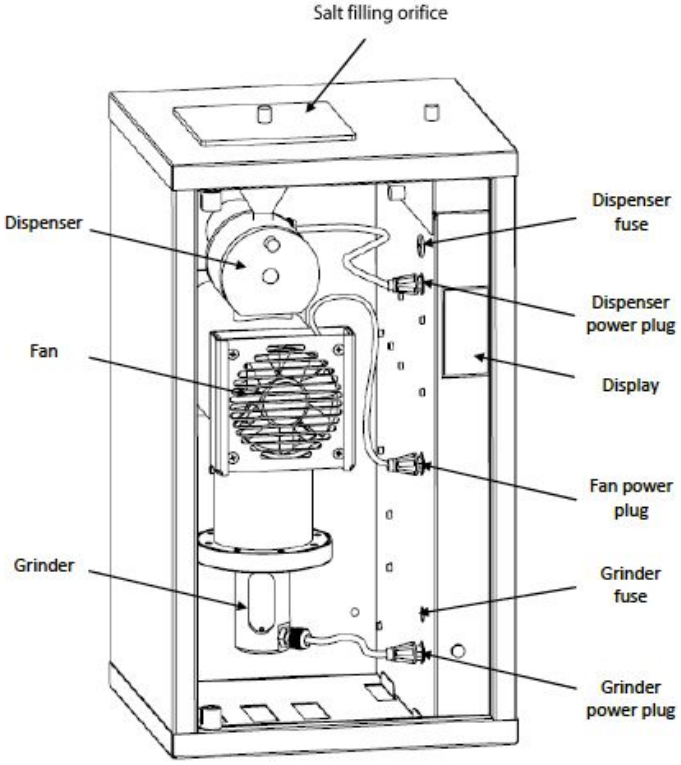
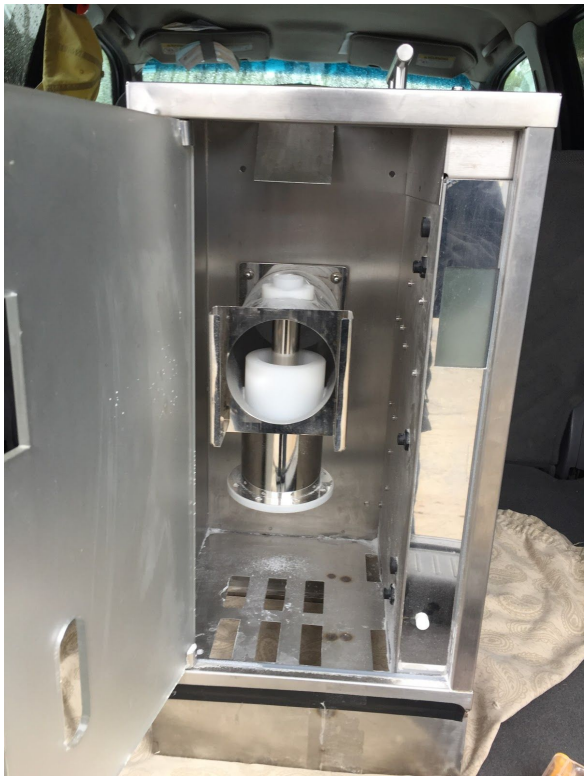


Fig.P 1.0

Fig.P 1.1



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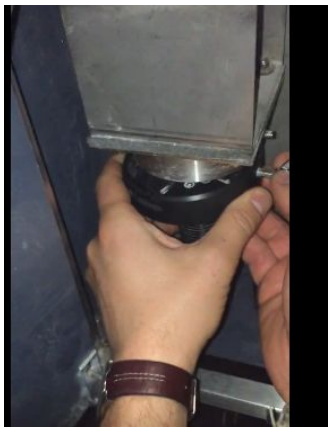


Fig. B 2.0

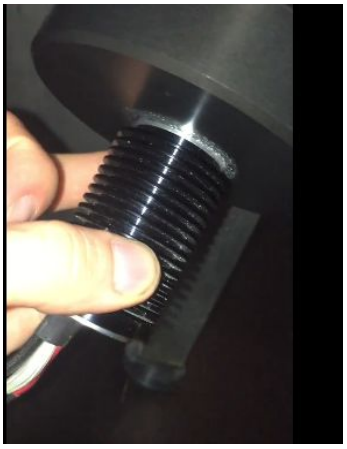


Fig.B 2.1

Fig.B 2.2

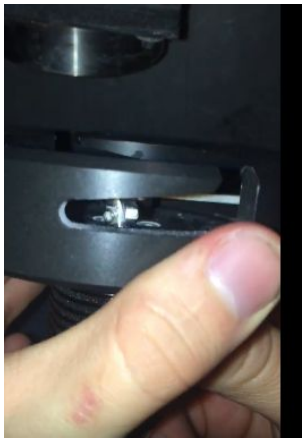


Fig.B 2.3

Fig.P 2.0

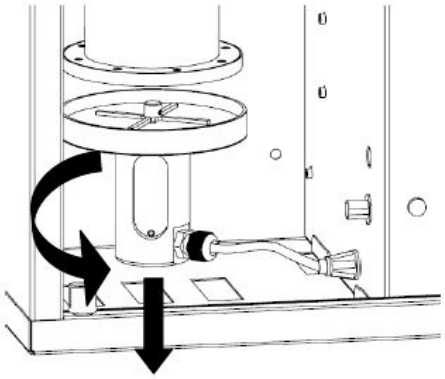


Fig.p 2.1

Fig.P 2.2

Fig.P 2.3

Fig.P 2.4

Fig.B 3.0

Fig.B 3.1

Fig.B 3.2

Fig.B 3.3

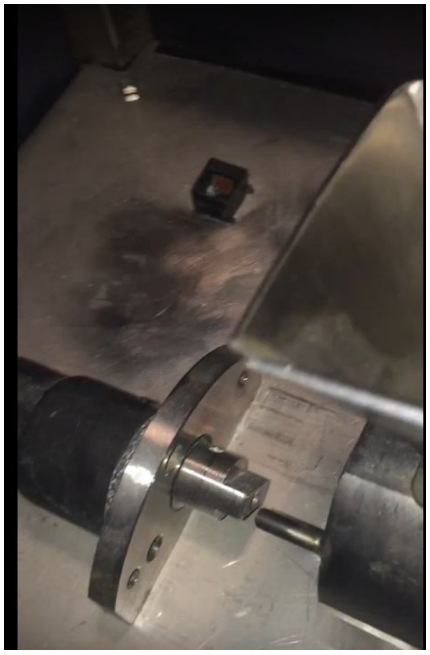


Fig B. 4.0

Fig B. 4.1

Fig.P 4.0

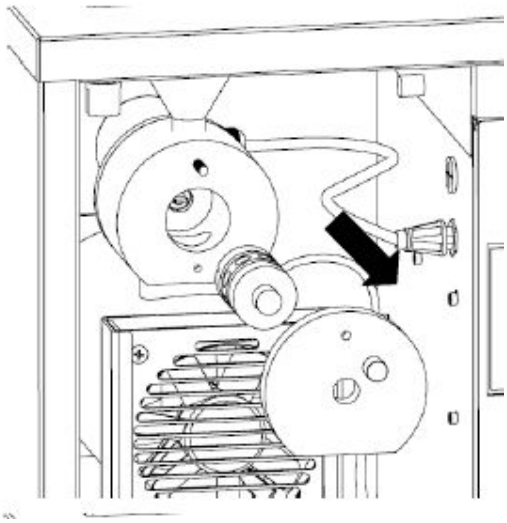


Fig.P 4.1

FigP. 4.3

Fig.B 5.0

Fig.B 5.1

Fig.B 5.2

Fig.B 5.3

Fig.P 5.0

Fig.P 5.1

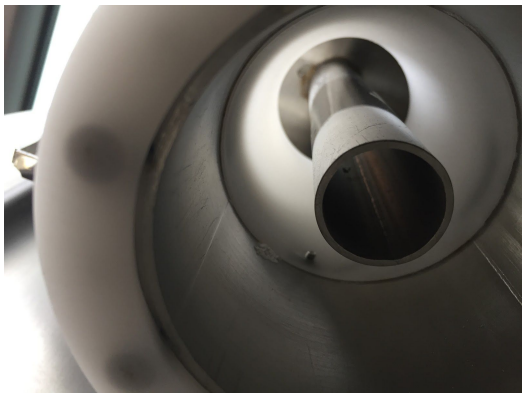
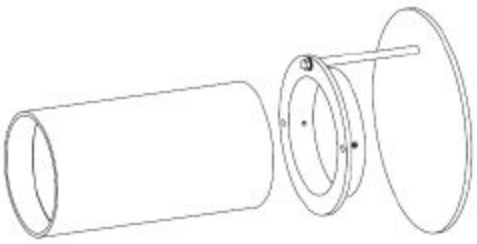


Fig.P 5.2



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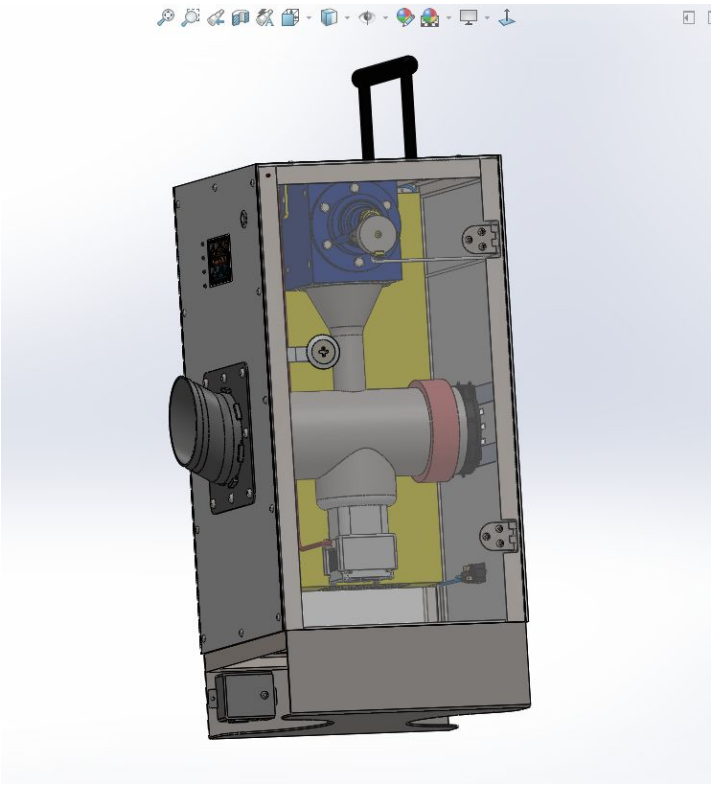
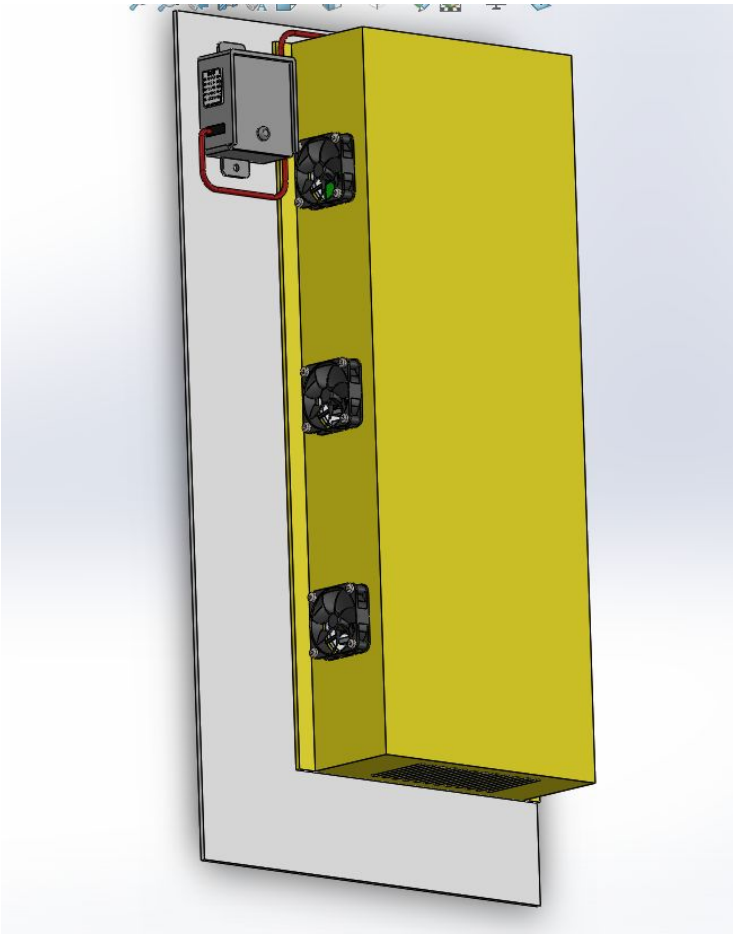


Fig.C 6.1



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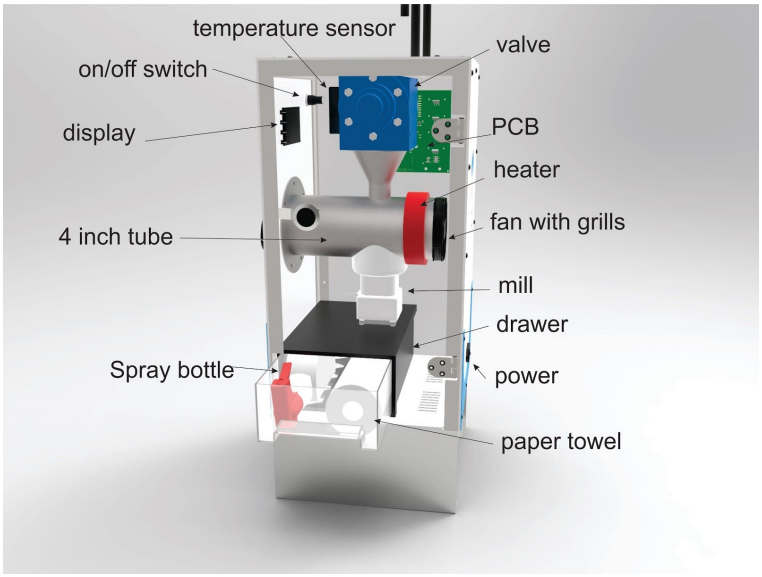

Fig.C 6.3