

# **Wildlife Incubator: PDS**

9/22/2023

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## **Function:**

Wildlife rehabilitation often includes caring for neonatal wildlife who are unable to control their own body temperature, thus the incubator must provide supplemental temperature control. Although private parties frequently contribute to wildlife rehabilitation efforts, they do not have enough financial resources required to purchase an incubator. As such the wildlife incubator must be low cost, while also durable, modular, easy to clean, and precise in temperature control. It is essential to create an incubator that is more accessible and accommodating for those interested and passionate about wildlife rehabilitation but may lack the financial resources to purchase components currently available in the market.

## **Client requirements:**

- I. Dimensions should be 18" x 18" x 18" and break down into a box that is 20" x 20" x 8" or smaller for shipping purposes
- II. The incubator must be under \$100/unit to manufacture
- III. The incubator should involve modular parts that allow for easy replacement
- IV. The incubator must maintain a temperature of 95 degrees Fahrenheit with a buffer of +/- 1-2 degrees

## **Design requirements:**

### **1. Physical and Operational Characteristics**

#### *a. Performance requirements:*

- I. The incubator should be durable enough to easily withstand regular operational use and cleaning regimen. This may include:
  - A. Transport/regular removal of the incubator and its modular parts.
  - B. Sustained weight load from animals on the modular parts.
  - C. Scrubbing and cleaning using high temperatures and/or chemicals on the incubator and its parts.
  - D. Exposure to humid conditions
- II. Incubator door:
  - A. Should be large enough to insert and remove modular parts.
  - B. Should allow for easy access for cleaning.
  - C. Should allow for easy access to the water basin for humidity control.
  - D. Should allow for easy access to the animal inside.
  - E. Should be transparent to allow for observation of the animal inside.

- III. The bottom of the incubator should be a 4 inch deep “tray” with smooth sides to make it easy to clean.
- IV. The base of the incubator should have indentations that will allow secure placement in a rack, enabling stacking of multiple incubators.
- V. Humidity control
  - A. There must be a spot to put water for humidity control.
  - B. There should be an obvious alert system to indicate when water needs to be added to the system, or if the humidity level is outside of desired ranges.
  - C. Should have the ability to increase humidity up to 60% without additional sealing on the door.
    - 1. The ability to increase to 70% humidity is ideal.

b. *Safety:*

- I. There should be no sharp edges on the interior surface to ensure the safety of the wildlife inside of it.
- II. The incubator should be assembled with seals / bolts that are smooth on the inside of the incubator for easy cleaning and safety of the wildlife inside of it.
- III. Accurate temperature and humidity control for the safety of the wildlife.
- IV. Should have failure alerts and fail-safes.

c. *Accuracy and Reliability:*

- I. Accurate temperature control inside the incubator with a typical range of 90 to 100 deg F and temperature of the incubator needs to be within 1 to 2 degrees F of the target temperature set by the user.
- II. Humidity control should have a maximum error of 5% of the displayed humidity.
  - A. A 3% error is ideal.

d. *Life in Service:*

- I. It is preferred that the incubator has a life in service similar to current products on the market. This is typically defined as 1-3 years.

e. *Shelf Life:*

- I. The incubator will be stored in a storage unit that does not include climate control and thus the components should be able to withstand being in a variable environment.

f. *Operating Environment:*

- I. The user should be able to store this incubator in a storage unit that isn't climate controlled in Arizona or Minnesota and they should expect it to work when they bring it into a climate controlled building.

g. *Ergonomics:*

- I. The incubator should allow for easy access to the animal, as employees will be checking on the

animals frequently.

- II. The incubator should be easy to carry and be lightweight such that employees can move it from the shelves that it will be stored on.
- III. Electronics must be housed within the incubator at a height such that the animals cannot reach them.

h. *Size:*

- I. The outside assembled dimensions of the incubator should be 18" x 18" x 18".
- II. The unit should ideally be able to be broken down into a box that is 20" x 20" x 8" or smaller for shipping.

i. *Weight:*

- I. OSHA requirements typically recommend that workplaces do not allow carrying of equipment over 35 lb. Many kinds of newborn livestock, such as sheep, weigh about 15 lb. Therefore, the incubator should not exceed 20 lb. [1]

j. *Materials:*

- I. Materials for the outside should be made of injection molded plastic or a similar lightweight plastic.

k. *Aesthetics, Appearance, and Finish:*

- I. The design should incorporate a see-through door.
- II. The temperature monitor should be able to be set to display the temperature in fahrenheit or celsius.
- III. The external portions of the incubator can be "angular" if needed.

## **2. Production Characteristics**

a. *Quantity:*

- I. At this time, only one prototype is required. The client would like to be able to replicate the product in the future.

b. *Target Product Cost:*

- I. The incubator must cost less than \$100 per unit to produce including labor and materials.

## **3. Miscellaneous**

a. *Standards and Specifications*

- I. The incubator would ideally be able to accommodate changes in the power cord/power supply so a second mold is not needed (for example, international power cord requirements versus the standards for the US).
- II. Need appropriate electronics approved for sale in the United States.
- III. The FDA recommends running an incubator for 1 week prior to use with a new patient.
- IV. An incubator is a class 2 device as defined by the FDA. Requirements are as such [2]:

- A. Requires 510(k) application to be submitted to market.
- B. Requires a set of performance standards, labeling, testing data, and “post-market surveillance”.

b. *Customer:*

- I. The users of this incubator would likely be private parties that feel passionately about wildlife rehabilitation.
- II. These users would require a low cost and easily accessible incubator to allow for the highest impact in wildlife rehabilitation.

c. *Patient-related concerns:*

- I. The device should be sterilized between uses to ensure that all animals are being safely handled and that no mixing of environments is occurring

d. *Competition:*

- I. Brinsea Incubators [3] come in a variety of sizes and are often used at wildlife rehabilitation centers [4].

## References

- [1] “NIOSH sets 35-lb limit as the max for safe lifts,” Relias Media.  
<https://www.reliasmedia.com/articles/9596-niosh-sets-35-lb-limit-as-the-max-for-safe-lifts>
- [2] “Overview of Medical Device Classification and Reclassification,” U.S. Food and Drug Administration.  
<https://www.fda.gov/about-fda/cdrh-transparency/overview-medical-device-classification-and-reclassification>
- [3] “TLC-40 Eco Series II Parrot Brooder/Intensive Care Unit/Recovery Incubator,” TLC Brooders/Intensive Care Units,  
<https://www.brinsea.com/p-679-tlc-40-eco-series-ii-parrot-brooderintensive-care-unitrecovery-incubator.aspx> (accessed Sep. 20, 2023).
- [4] “The incubators,” BabyWarm, <https://www.babywarm.org/about-the-incubators/> (accessed Sep. 20, 2023).