

## **A Study on the Development of the Design of Industrial Animal Biodegradation Handler for Environmentally Friendly Use**

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### ***Abstract***

*Livestock farmers are using animal carcasses to dispose of the carcasses of livestock that have died of natural causes or disease. Most of the existing livestock carcass processors are mechanical in their structure without considering the environment. It has a function of sterilizing dead bodies at high pressure after processing them and causes environmental problems such as carbon monoxide emissions. If livestock carcasses occur, livestock farmers have to purchase their own livestock carcasses or entrust them to the outside world, which is costly. For this reason, the possibility of environmental pollution, infectious diseases, and spread has been increased recently by frequent dumping of dead bodies. The carcass of livestock mixed with manure not only serves as a medium for infectious diseases but also needs to be buried on a large scale as foot-and-mouth disease and avian influenza spread.*

*As a result, the possibility of environmental pollution, such as contamination of groundwater, is increasing, so research is needed to protect and improve the environment. We aim to improve the process of processing livestock carcasses and purify the agricultural environment through development results on the form, structure and function of eco-friendly livestock carcasses. Its shape is applied with natural shapes such as stones and seeds. The material used in the dead body process is a brown beggar biocouple and is applied with an eco-friendly industrial animal recycling process. As a result of the study, it is expected to improve odors and the environment, and to be used as data to improve and help the livestock industry in the future.*

**Keywords:** *Livestock Carcass Disposal, Eco-Friendly, Milworm, Environmental Improvement*

### **1. Introduction**

Recently, environmental studies have continued in various fields. Environmental management is also an important factor in livestock farms. The purpose of the study was to: Livestock carcass processors are used in livestock farms to treat the carcasses of livestock that died naturally or died of disease. Existing livestock carcass processors are mostly mechanical forms that do not take into account the environment and have the main function of sterilizing dead bodies with high pressure. When livestock carcasses occur, livestock farms have to purchase livestock carcasses on their own or entrust them to the outside world, which is costly. For this reason, the possibility of environmental pollution and the spread of infectious diseases is increasing due to the frequent dumping of dead bodies. The corpses of livestock mixed with manure should not only serve as a medium for diseases such as infectious diseases as they decompose, but also bury healthy livestock as foot-

and-mouth disease and avian influenza spread.

As a result, research is needed to protect and improve the environment as the possibility of environmental pollution is growing, such as polluting groundwater. The purpose of the project was to develop the form, structure, and function of eco-friendly livestock carcass treatment machines, and to add a status survey and design form. In particular, it is intended to study feed and fertilizer by using wheatworms for eco-friendly systems of farms.

## 2. Main text

### 2.1. Status of Slaughter of livestock

The number of breeding heads has been steadily increasing every year due to the intensive and large-scale growth of the livestock industry. Recently, the problem of dealing with slaughtered livestock has been studied as the domestic livestock industry has suffered serious economic damage due to the outbreak of livestock epidemics (e.g. foot-and-mouth disease, avian influenza, etc.). In addition, the environmental impact of these slaughtered livestock has become a serious problem not only in Korea but also in the world [1]. Since livestock epidemics are occurring every year in Korea, various efforts are needed to minimize economic damage to livestock farmers and prevent environmental pollution in areas where livestock diseases occur.

### 2.2. Cadaveric Treatment Background

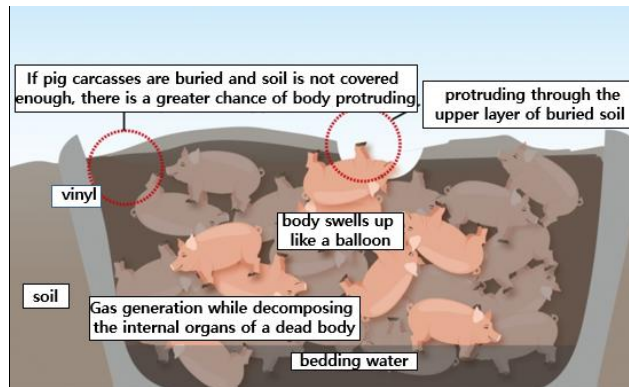
In the agricultural sector, which is classified as a labor-intensive industry, agricultural conditions are getting worse, including the continued decline of the agricultural labor population, aging population, opening overseas markets, and frequent livestock diseases [2]. A burial site for a foot-and-mouth disease pig near a farm in Icheon, Gyeonggi Province in Figure 1. As shown in Figure 1, it is a pig burial site near a livestock farm in Icheon-si, Gyeonggi-do. As gas filled the intestines of the pig buried alive, the bodies penetrated the soil and climbed out, the soil was rebuilt and covered with plastic.



**Figure 1. Pig burial site in Gyeonggi-do**

Under the Livestock Disease Prevention Act, livestock carcasses that have been destroyed are incinerated and buried, and other livestock carcasses that have been transmitted to livestock diseases need to be managed. However, due to the domestic livestock environment, incineration and other disposal procedures are difficult in reality, so most of them are processed according to the method of burial. Most domestic research on the treatment of livestock carcasses is centered on prevention of the spread of infectious diseases, exterminating and managing areas where livestock is buried, animal welfare and disposal of carcasses that are safe from the environment, and so far, little research has been conducted on recycling livestock carcasses killed by livestock

epidemics. Systematic research and alternatives on the recycling research of slaughtered livestock carcasses are needed in Figure 2.



**Figure 2. The ejection of a burial sit**













### 3. Development System

Existing livestock carcass processors are mostly mechanical forms that do not take into account the environment and have the main function of sterilizing dead bodies with high pressure. animal carcass processor and shredder There are carcass processors and carcass shredder sets that can be sterilized and composted by sterilizing ducks, chickens, and pigs that have died at livestock farms. The carcass has a capacity of 200kg and can be treated with a large amount of livestock at once, and can be used anywhere after purchase in Figure 3 [4].















**Figure 3. Livestock carcass treatment machine**

According to the characteristics of each carcass processor, it is difficult to purchase it at most livestock farms because of its high price, although it completely blocks secondary pollution caused by pollutants (relief, bird flu) and completely combustion caused by high temperatures in Figure 4 [4].

No	Photo1	Photo2	Photo3	Characteristics
1				Animal carcasses, livestock carcasses, shredders / animal carcasses and shredders. A set of carcasses and shredders that can be composted by sterilizing ducks, chickens, and pigs that have died in livestock farms.
2				An incinerator that completely blocks secondary pollution caused by animal carcasses incinerators (abandoned and incinerated) and contaminants (relief stations, bird flu) and completely combustion caused by high temperatures and has no fear of secondary contamination or transmission.
3				Potae, death and feather-treatment systems. Disposal capacity is available three times a day for 80 tons of slaughtering waste, and it is equipped with feather-based processing facilities-meters and waste disposal facilities-cooling, grinding and packaging facilities.
4				Manufactured, assembled, and equipped with technology for livestock free disposal facilities and animal carcass treatment facilities. It has obtained quality certification and environmental management certification and has proprietary patent technology and know-how.

**Figure 4. Cadaveric treatment features**

The mobile incinerators, which are used to minimize economic damage and environmental pollution caused by burial sites, are applied with the technology to remove livestock from foot-and-mouth disease by melting them at high temperatures.

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1				Animal carcasses, livestock carcasses, shredders / animal carcasses and shredders. A set of carcasses and shredders that can be composted by sterilizing ducks, chickens, and pigs that have died in livestock farms.
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### 4. Design Concept and Design Direction

Oreum is a type of monoclastic volcano, most of which correspond to pyroclastic cones, or cinder cones. Parasitic acid, also known as geophosphoric acid, in relation to Mt. Halla. The analysis zone is a small cone-shaped volcanic body formed by volcanic debris released by explosive differentiation that builds up around the crater. The Jeju dialect, which refers to parasitic volcanoes, operates a livestock farm around it. The design concept was based on the shape of the oreum that goes well with the farm and added a more usable form, which was analyzed on a 7-point scale based on originality, functionality, economics, and aesthetics. The survey was conducted on 50 farm owners who run livestock farms in Figure 5.



Figure 5. Oreum of Jeju

When the survey items are listed, O stands for originality, F stands for Functionality, E stands for Economic Efficiency, B stands for Beauty, and 7P stands for 7-point scale mean in Table 1.

Table 1. 7-point scale analysis table

N	Form	O	F	E	B	7 p	Design Concept
1		6.5	6.0	4.0	4.5	5.25	It's a free-shaped stone. Create designs with a nature friendly feel
2		6.9	6.5	6.5	6.8	6.68	It is a design form reminiscent of the rise of Jeju Island, and the cas-e is made of underground containers
3		4.0	4.6	4.8	4.9	4.58	The modern form of a circular triangle is clean. modern design image
4		4.0	3.7	4.7	4.0	4.10	Flat, layered, stacked, designed to utilize space
5		4.0	4.0	4.3	3.9	4.05	It is made of paper and can be used efficiently when installed in a small space

### 5. Final Design and Materials

The milworm, which we commonly call, was not originally a species that lived in Korea, but it is now partially indigenous and lives under the name of a brown beggar. It is the most common food for spider lovers

and is used as a food for insectivorous plants and is very convenient to manage. Recently, it has been widely used as food and food insects for pets. The life cycle is egg, larva, pupa, and adult phase, and one cycle ends in about three months. Since it is a larva stage when used for food, it is being studied to use it as a material that makes the body eat until it becomes an adult. milworm, which has eaten all the dead bodies, is planned to be used as fertilizer for the farm and will be used for products considering the environment in Figure 6.

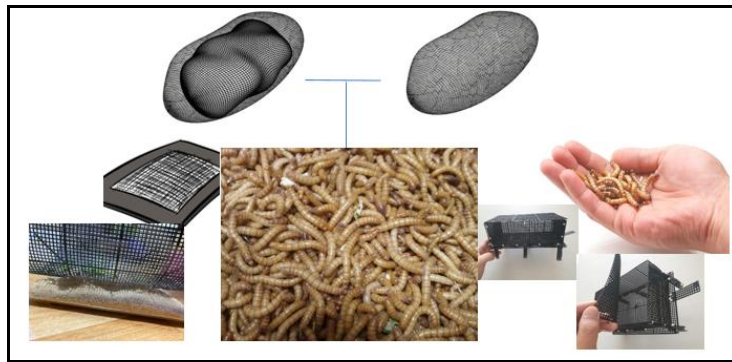


Figure 6. Features using eco-friendly milworms

The final result of the 2nd ascending design with a high average score of 6.68 on the 7-point scale is as follows. The shape shown on the ground is a form of ascension, and the case below the ground is planned to be buried to utilize the space will be used. For the material, milworm's carcass treatment is carried out in an eco-friendly carcass treatment machine, and the colorless plastic ABS material is used in consideration of the mammary duct identification work. Although color was added to reduce disgust, and it was difficult to install the existing carcass treatment machine on each farm because the price of the existing carcass treatment machine was high, the price of the eco-friendly carcass treatment machine was set at a low price, making it suitable for distribution to farming households. Afterward, the design will be developed by separating the range of livestock such as Korean beef, pork, and poultry. It will also enhance the efficiency of carcass treatment in various forms considering the size of each capacity and improve the odor and environment through eco-friendly milworms and additional maggots experiments in Figure 7(a~d).

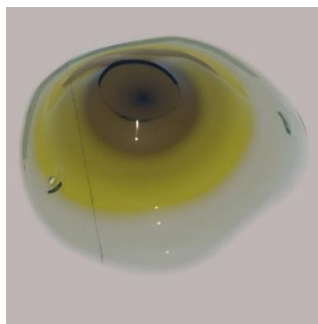


Figure 7(a)



Figure 7(b)

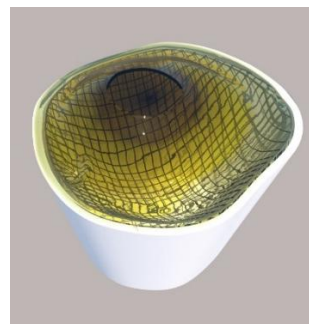


Figure 7(c)



Figure 7(d)

Figure 7. Design reflecting the form of ascension (Registration No.30-1109504)

### 5. Conclusions

The livestock carcass processor, used to treat the carcasses of livestock that died of natural death or disease, has the main function of sterilizing the carcasses under high pressure, but is made in a form far from the natural

environment. This mechanized type of price is so high that farm owners who run small farms find it difficult to purchase and find an easy way to deal with it. As the carcasses of livestock are mixed with manure, the problem of odor, a chronic problem of livestock farmers, is becoming more apparent. First of all, small equipment was developed as a way to solve cost problems, and designs were developed while recalling Jeju's livestock farms. The carcass processor, which is made of a design reminiscent of the rise of Jeju Island and a container buried beneath the ground, goes well with the environment of the farm that gives the impression of nature, and the material called milworm has the advantage of treating the carcasses of industrial animals as eco-friendly and improving the odor and environment. Expecting that the results of the study will be used as data to improve and help the environment of the livestock industry, further research is looking for ways to utilize maggots similar to milworms.

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