Smart Storage for Pelleted Rabbit Feed

Ho Rui Jin
Politeknik Kuching Sarawak
horuijin@poliku.edu.my

Blangkat Ahmad Basimin
Politeknik Kuching Sarawak
blangkat.a@poliku.edu.my

Andy Buja
Politeknik Kuching Sarawak
andy@poliku.edu.my

Ong Tze Ching
Politeknik Kuching Sarawak
tze@poliku.edu.my

Abstract
Air humidity plays an important role in maintaining dried pelleted rabbit feed quality. High relative humidity of air in the equatorial climate will lead to the growth of fungus and mold on the pelleted rabbit feed. As consequence, high levels of rabbit deaths occured in Gold Rabbit Farm, Bintangor due to contaminated pelleted rabbit feed. The innovation of this project is related to the need for clean storage and relative humidity controller to maintain the quality of the pelleted rabbit feed. Thus, a dry food storage area is designed and fabricated by installing air dehumidifier. The storage space is airtight and large in size to accommodate a large quantity of food stocks and has the ability to maintain a low relative humidity air. The existence of this storage allows entrepreneurs to store more pellet feeds and reduce mortality due to food poisoning. As result, the cost of production decreases and profits increase with reduction of rabbit fatality.
Keywords: relative humidity, pelleted rabbit feed, storage space

1.0 Introduction

A study that was conducted on Gold Rabbit Farm, a Small Medium Enterprise that ventures into rabbit farming has identified a correlation between high mortality of rabbits in the farm with contaminated the pelleted rabbit feed. High humidity in tropical climate where this venture is located has caused fungus and mold growth in the storage that contaminates the pelleted rabbit feed as mentioned by Joerg Mayer.

A storage space was designed to integrate an air dehumidifier with humidity feedback control. The storage is expected to increase the shelf life of the rabbit feed, reduce fungus growth and prevents further rabbit fatality. This storage has been designed with durability, portability and minimal maintenance in mind.

2.0 Material and Methods

A customized low power dehumidifier is designed with humidity feedback sensor installed at the rear of the dry storage. Humid air will be pump with two centrifugal fan from the duct at the top of the storage before feeding into dehumidifier. Dehumidified air will be recirculate back into the storage from duct at bottom of the storage space. This is because humid air has lower density if compared to dry air. The dehumidifer will externally to improve moisture rejection and prevents evaporation if compared to dehumidifier installed internally.

In order to achieve the desired level of dry air inside the storage space, an air tight storage space was used. The storage space measures 8 feet by 20 feet x 8 feet/2.4 meter x 6 meter x 2.4 meter (width x length x height) with an internal volume of 1170 cubic feet/33.1 cubic meters as stated in the user manual.

The current storage space shown in Figure 1(a) is not air tight where humidity of the storage space depends on relative humidity of the surrounding. Hence, a shipping cargo is chosed as the storage space as the lining of the door are installed with air tight lining as shown in Figure 1(b).

(a) Existing Storage Space

(b) New Storage Space

Figure 1: Storage Space

3.0 Result and Discussion

Table 1 shows the fungus and mold growth after 7 days when the pelleted rabbit feed was kept in the existing storage space where humidty was high. Fungus and mold growth at a surface depends on the moisture available at the surface, typically referred to as the "water activity." The water activity denotes the amount of free water available for growth at the nutrient surface (Riordan, 2016).

Table 1 also shows that fugus and mold growth has been prevented with the usage of air tight storage space with humid air been removed via dehumidifier in the same time frame.

Table 1: Comparison of pelleted rabbit feed with and without dry storage

DETAILS	BEFORE	AFTER 7 DAYS
Without dry storage		
With dry storage		

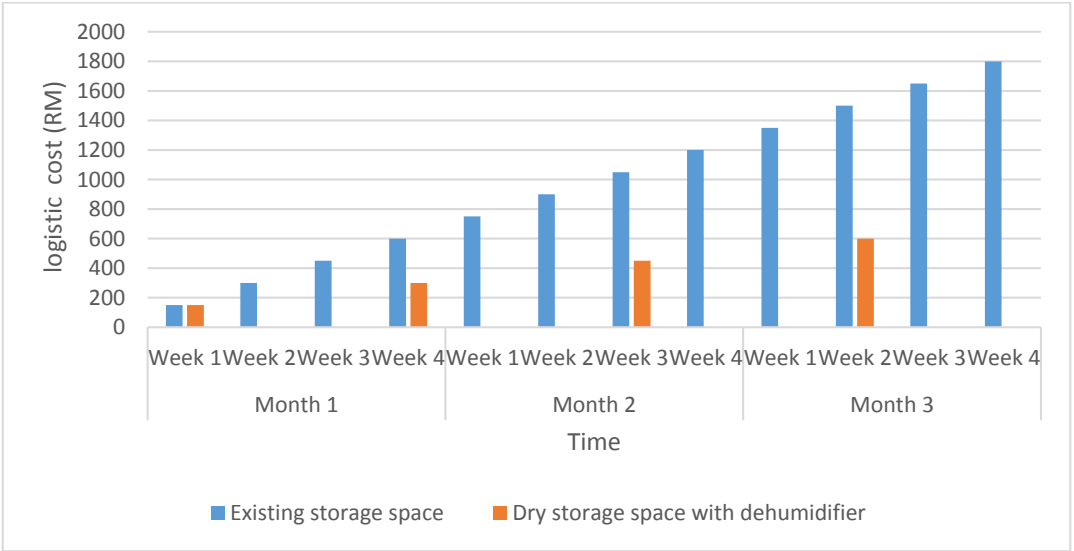

Figure 3: Comparison of logistic cost

Figure 3 shows the cumulative cost of logistic for transporting the pelleted rabbit feed over a period of 3 months. The existing storage space could only hold 50 gunny sacks per week due to limitation of space and fungus and mold growth. With the introduction of the dry storage space, the number of trips to restock has been reduced to once a month because the number of gunny sacks able to be stored are increased 150 sacks per restock thus reducing logistic cost.

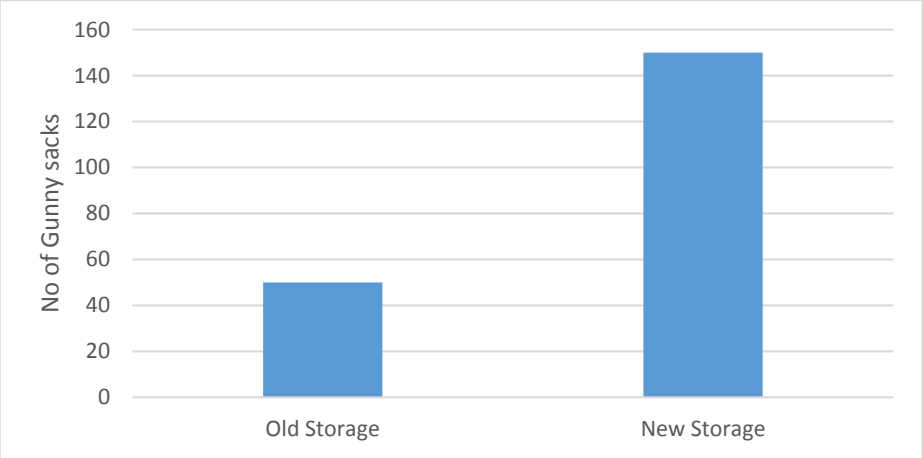

Figure 4: No of gunny sacks restockable

Figure 4 refers to the number of gunny sacks for palleted rabbit feed that the existing storage and new storage could hold at each restock period. The exsting storage space could only store 50 gunny sacks each time due to the small size of the space available and the potential of exposure to humid air that causes fungus and mold growth. The dry storage has increased the storage capacity to 150 gunny sacks and eliminating the cause of fungus and mold growth, which is humid air, by been an airtight space and having humid air removed by using a dehumidifier.

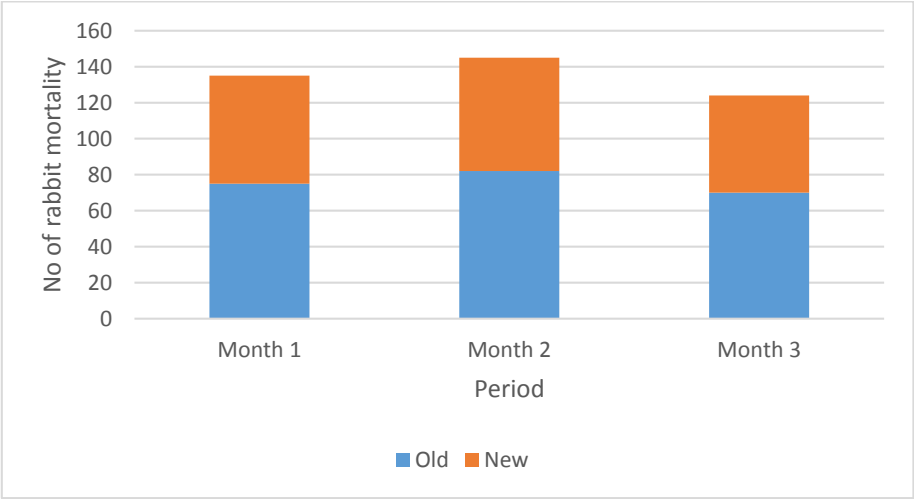

Figure 5: Rabbit Mortallty

Figure 5 illustrates on average 75 rabbit mortality when the pelleted rabbit feed was stored in the old storage space. On the other hand, the average of 59 rabbit mortality was recorded when the pelleted rabbit feed was stored in the new storage space, the graph shows that the total average mortality was reduced by around 20% over all in each month.

This reduction in rabbit mortality is attributed to the effectiveness of the smart dry storage in removing humidty from the palleted rabbit feed thus preventing fungus and mold gowth that contaminates the palleted rabbit feed.

4.0 Conclusion

Gold Rabbit Farm has reported that the smart dry storage is effective in keeping the pelleted rabbit feed dry and has prevented fungus and mold growth from occurring on the pelleted rabbit feed. This has in turn reduced the farms' rabbit mortality numbers that is attributed by food poisoning. The number of rabbit mortality has reported to have gone down by 16 rabbits on average over a three month period or down by 20% on average. The results are in line with the objectives which are to prevent fungus and mold growth, apart from reducing the number of rabbit mortality.

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