

Manure Belt Dryers in Alberta Layer Barns

Manure Moisture and Nitrogen Content

In Collaboration with Egg Farmers of Alberta

A team from Alberta Agriculture and Forestry (AF) and Egg Farmers of Alberta (EFA) investigated gaps related to benefits, costs and challenges of using manure belt dryers in Alberta layer barns.

Staff investigated manure drying effectiveness and its impacts on manure moisture and nitrogen content in both summer and winter conditions.



Poultry Manure Value

The value of poultry manure is higher than cattle or hog manure generally because it contains higher nutrient concentrations. Typical nitrogen (N) concentrations in Alberta layer manure ranges from 50-70 lbs per ton, with moisture content ranging from 30-70%. Manure nutrient and moisture content can vary depending on several factors including:

- the housing system and conditions,
- feed nutrition,
- flock age, and
- manure handling and storage.

Fresh manure has high moisture content (~75% moisture) as well as high N content. Nitrogen declines quickly as a large portion (50 to 80%) is converted to ammonia (NH₃) that is lost to the atmosphere. However, if manure can be dried below 40% moisture content within 50 hours, then there will be minimal NH₃ losses and more N is retained in the manure.

Thus, benefits of dried manure include:

- reduced in-barn ammonia and odour,
- reduced manure weight and volume for hauling,

- cleaner manure belts during every day use, and
- barn cleanout at the end of the laying cycle.

In-Barn Testing

Methods

Staff used benchmarking information to develop nine scenarios to test in-barn manure belt drying effectiveness regarding manure moisture and nitrogen content in both summer and winter conditions.

Table 1. Testing Scenarios

Manure Drying Time	Manure Removal Frequency		
	1 Day	3 Day	7 Day ¹
No drying	Nd1	Nd3	Nd7
10 hrs	10h1	10h3	10h7
20 hrs	20h1	20h3	20h7

¹During winter testing the seven day removal scenarios were dropped to six days due to high in-barn ammonia levels.

Manure samples were collected and analyzed at the end of each scenario. Other key variables monitored during scenario testing included indoor and outdoor temperature, humidity and in-barn ammonia concentrations.



Figure 1. Manure sample collection

Results

Summer results suggest that barn temperature, humidity and ventilation affected manure moisture

content more than manure drying in the aviary barn. In the furnished barn, manure drying had greater impact and resulted in drier manure versus without drying. Manure drying in the winter resulted in significantly drier manure at both farms.

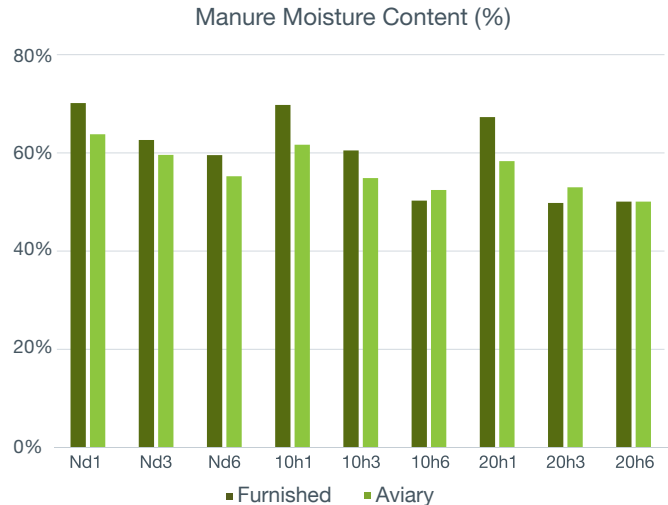


Figure 2. Manure moisture content from winter testing

With reduction in manure moisture content, theoretically, there should be increased manure nitrogen content. However, there were no significant trends observed for nutrient content in the samples collected. This may be due to variability of the manure and small total sample size. A more controlled research study is required to identify nitrogen retention trends.

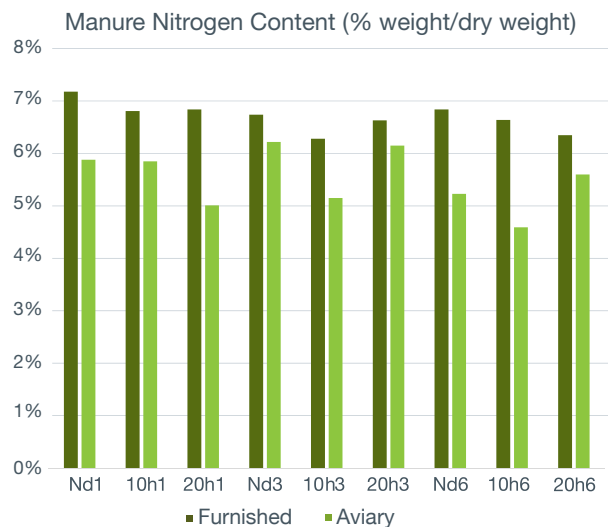


Figure 3. Winter manure nitrogen content

Economic Analysis

Economic analysis showed that potential revenue from the manure is heavily dependent on nitrogen content of the manure, which can be highly variable. As nitrogen content of the dried and undried manure was similar, the benefit of drying was not realized.

Results also showed that variability in bird age and barn population affect the market value of the manure.

Key Learnings

- The impact of manure drying was more significant in the winter.
- Further testing would be required to quantify nitrogen retention resulting from manure drying.
- To retain maximum value of the manure, it must be stored in covered storage once it leaves the barn.

Additional Recommendations

For those that have invested in manure belt drying systems, other recommendations based on the research findings to improve efficiency and reduce operational costs are:

- Use a belt dryer until the flock has reached peak production to reduce manure moisture content and ambient ammonia levels.
- Use the manure dryer when salt is added to feed rations to reduce pecking and bullying as higher salt levels likely increase manure moisture content.

- Run the manure dryer while cooling misting systems are operating in summer to reduce manure moisture content and thus prevent increased in-barn ammonia.

For other recommendations to improve manure dryer efficiencies and reduce operational costs, see the following factsheets:

- Project Overview
- In-barn Air Quality
- Overall Economics and Learnings

For more information on this project, read the Manure Belt Dryers in Alberta Layer Barns Final Report.