Automated Manure

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moisture to 19 per cent, the cost was $10 08 per ton of product remaining; without heat cable the moisture was reduced to 30 per cent for a cost of $1 76 per ton of product remaining In other experimental periods the value of supplemental heat for drying was clearly demonstrated but the higher costs may prove the method impractical

Stirring droppings and use of fans underneath the sloping wire floor gave sufficient drying to result in a textured manure relatively free of odors and suitable for field application By removing a substantial amount of moisture inside the poultry house cost of hauling could be cut to one-third normal requirements

Experiment II 1968-69

Drying Methods Used

Ventilation

The ventilation system was quite similar to the one used in the 1967-68 experiments. However, some very significant changes were made

The size of the fans used for circulating air was increased An aluminum four bladed fan with a 16 degree pitch, powered with a totally enclosed ½ H P single phase motor instead of ¼ H.P. and delivering 4900 cubic feet per minute, was used. These fans were located in positions similar to the previous experiment.

The use of the more powerful fans resulted in an average air velocity of over 500 feet per minute in contrast to 250 feet per minute However, electrical consumption also was increased

After several trials it appeared that the distance between fans could be increased without seriously impairing drying capabilities From early February three fans were used in each pit area instead of four

The first two fans in each pit were about fifty feet apart lengthwise to the pit and pointed toward the manure-unloading end of the house The third fan was located at the end of each pit next to the cross conveyor and mounted so as to blow the air downward into the manure instead of lengthwise With this arrangement air velocities over 1,00 feet per minute were blown directly into the manure before removal at the unloading end of the poultry house

Stirring

Minor changes were made in the design of the stirring and cleaning mechanism to improve its efficiency.

Supplementary heat

Heat cables were eliminated in most of the experimental periods.

Procedures and Results

A number of preliminary drying trials were conducted with the two flocks of layers during the August, 1968, to March, 1969, period. Trials consisted of evaluating the significance of changes in air velocities, frequency of stirring, and to a limited extent use of heat cable Beginning in March and early April the number of fans per pit in each house was cut to three Stirring varied from four to ten times each 24 hour period No heat cable was used

In the one 30 by 100 feet house with leghorns housed on the A-frame sloping wire floor a total of 28,790 pounds were removed during 15 separate experimental periods from March 25 to July 14 The increase in electrical costs of ventilation for drying amounted to $45 88 or a cost of $3 05 per ton of manure remaining The manure averaged between 30 and 40 per cent moisture.

By further drying the manure after it was removed from the poultry house with a commercial dryer, the quantity of manure remaining was reduced to 17,556 pounds with less than 10 per cent moisture content. Combining the actual drying costs for increase in ventilation and the dryer, a total of $66 58 was obtained This calculated to a cost of $7 60 per ton of the less than 10 per cent dry manure remaining

In the other 30 by 100 feet house with the V-frame sloping wire floor, 27,550 pounds of manure, were removed during 14 experimental periods from April 3 to July 14 The increase in electrical costs of ventilation for drying amounted to $46 23 or $3.20 per ton of manure remaining averaging between 30 and 40 per cent moisture.

The total cost of drying for increase in ventilation costs and the dryer amounted to $68 04 or a cost of $7 80 per tone of manure remaining A total of 17,220 pounds of manure with less than 10 per cent moisture remained

When direct field application is planned, the first drying stage is all that is needed The manure can be removed on a continuous automatic basis or at intervals of several weeks

If both drying stages are desired in order to produce a dry manure suitable for sale as an organic fertilizer, the two stages can be integrated as a complete automatic drying system

From these and earlier experiments it was noted that on the average after the first stage of drying inside the poultry house the manure remaining amounted to slightly less than half the weight of feed consumed.

Thus, when chickens consume 1 ton of feed, approximately ½ ton of relatively dry manure remains

After the second stage of drying with the use of the commercial dryer, the weight was reduced to about 30 per cent of original weight of feed consumed. Hence, slightly over ¼ ton of dry manure with less than 10% moisture remains from each ton of feed consumed by the chickens

Capital Investment

The estimated capital requirements for a flock of 25,000 layers for a 40 x 400 feet house for total ventilation with exhaust fans and circulating fans over manure run between 10 and 15 cents per bird.

The stirring and cleaning mechanism, including the power unit, cable, reversing and recycling units and cross elevator, also runs about 10 to 15 cents per bird

The commercial dryer adds about 20 cents per bird to investment requirements. If the dryer unit used in the experimental work was operated on a 24 hour a day basis instead of about 8 hour shifts, the investment could be cut to about 7 cents per bird

The capital investments mentioned are not added costs in total since all poultry houses would require a certain investment in both ventilation and cleaning equipment The added costs over conventional fan ventilation and cleaning methods would not be very large

Benefits of Dehydration

1 The weight of manure to be handled can be reduced to about ¼ to ⅛ the original weight produced The manure is in a dry, textured form that can be easily handled, thus reducing handling costs

2 Odors inside the house and in the commercial drying process are practically eliminated. Frequent stirring of droppings and use of high velocity air not only speeds drying but prevents excessive growth of anaerobic bacteria, the organisms which manufacture the offensive odors. Elimination of these odors at the outset is essential if the final dry product is to be free of offensive odors

Only by having a dry product free of obnoxius odors can it be merchandised successfully.

Eliminating odors make possible the use of the sloping wire floor and its manure dehydration system near urbanized areas without causing a nuisance

3. Less "down-time" between flocks is required since the manure is practically all removed by the time the flock is removed. This is in contrast to systems where manure is permitted to accumulate over the life of the flock.

4 Labor requirements for cleaning are sharply reduced.

5 Fly breeding areas are constantly being destroyed thus keeping flies under control

6 Capital investment requirements are relatively low.