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IMPROVING PERFORMANCE OF FLAT-LINK CHAIN FEEDER IN POULTRY HOUSES

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Abstract

The main objectives of this study to test the chain feeder system before and after modifying under three levels of chain feeder speeds was 25,30 and 35m/min and three levels of opening gate feed area was18,27and 36 cm².this modification using bearing with corner wheel lead tominimize energy and wearing between corner wheel feeder chine to increase the efficiency of chain feeder with subtle amount of forage components on trough chicken nurture. The results showing increased the Feeding rate of feeder from 31 to 81 kg/min when opening feed area increased from 18 to 36 cm² at 25 m/ min chain speed , at the same conditions, the total amount of feed increased the Feeding rate of feeder from 620 to 1,620 g/m Also the Feeder efficiency increased from 36.90 to 96.40% when using the opening feed area increased from 18 to 36 cm² at 25 m/ min chain speed The feeding system performance was evaluated under with and without load, the power requirement with ordinary fillers before modified deceased from 1.089 to 0.941 kW withload and without load at 25 m/ min chain speed also deceased from 1.026 to 0.846 kW withload and without load at modified system. The feeder chine loses increased from 280 to 900 g. when opening feed area increased from 18 to 36 cm² .Also Wearing behaviour compared between wheel before and after using bearing the wearing rate decreased from 0.90 to 0.35g/h before and after modified.

Key words**:** *poultry, chain feeder, losses, power, and wearing*

INTRODUCTION

Now A poultry house must be suitable for large scale production need to modern buildings and professional farm management addition to the equipment that are constructed in house should acceptable in size, watering, feeding, cleaning and ventilation systems also will reduction of labour number . The use of modern equipment makes it possible for huge number of chicken to control in all operation**s** in poultry house.[6] The optimum nutrition of broiler happened by automating a controlled feeding system, the automated equipment was helpful be applied in poultry projects [5]

This is a great potential, considering that maize is an important component, accounting for more than 60% of the poultry ration.[1]

The feeding equipment design be different on dissimilar farms. A lot of construction style were used to avoid waste the feeding devices should be easy to fill and clean. .The chickens cannot stay on one place, so the feeder constructed for all chicken to be able reach to feed. Automatic and mechanical feeders were fabricated as standard equipment on broiler farms. They keep fresh feed available to the chickens at all times and minimize of labour [8]

A lot of poultry farm were depended upon efficient and reliable mechanized systems of feeding hen. The automatic return switch reversing when the hopper unit reaches the far end for refilling. [2]

To minimize waste in feeding systems and keep the level of feed in the trough low using a deep trough with waste prevention lips. [4] .

Traveling hoppers are easily automated to operate at desired intervals with timers and automatically refilled between feedings; the cycle of feed above the cages or on the floor and dispense feed directly into the trough. Most troughs are flat bottom with one flared side. The traveling hoppers are lower initial cost than closed loop feeders. The chain travels at 100 to 500 mm/s depending on user

preference with 200 to 300 mm/s being common. [7]

Wear is a type of surface damage that arises from the relative motion between inter acting solid surfaces. It is a dynamic and complex process which incorporates surface and material proper ties, operating conditions, stresses, lubricants an d geometry [3].

A lot of problem happened in Flat-link chain feed system such as increase in friction resulting from wearing between wheel of corner and chain. The chain travels number and chain speed affected on feed homogeneous and distribution in the line feeder.

So The main objectives of this study to minimize wearing between corner wheel feeder chine and increase the efficiency of feeder with subtle amount of forage components on trough through chicken nurture.

MATERIALS AND METHODS

Field experiments were conducted at (Aga),(El-Mansoura), in private broiler house, Egypt. Closed house and Cobb 500 hen were used. The egg production for farms with capacity of 4 million eggs per year 2018. The periods of the experiments were 60 weeks. The environmental conditions were adjusting according to the ideal parameters. To study the modification the feeder on power consumption, wearing, losses of feed and egg-weight of hen.

Closed house: Five floor have (widths 12.5 and length 84 meters) the floor capacity were 4,000 hen. There are two periods the first called breeding period has24 weeks and second has 40 weeks is called production period. Feed type has six stages recommended aimed at female hen feed for session and divided according to the proportion of protein every age. Drinking system have three lines in the hen housed one line length is 81m for each line contains 27 pieces length of piece 3m each pieces have 12 nipple one of them enough to 12 bird Ventilation system evaporative cooling system were used, it have 8 ventilators each one 1m * 1m distributes air for 44,000 m^3/h with 6 brushes. Heating system have air forced heater consists of (furnace made of stainless steel, counter flow heat exchanger , axial fan)

Feeding system: The Closed loop floor chain feeder system as showing in Fig.1. consists of five basic components:

-Hoppers: The capacity differs according to the size of the hopper. (Width 1m * length 1m * height 1m) and the number of feed lines with volume 200 kg

-Trough: The ideal shape for width 9 cm and height9cm Length of part 300 cm, the external line was 186 m and the internal line was 174 m

-Chain: A chain consists of varying links. Each link has small facet to pushes the forage during the movement of chain by motor

-Corners: Designed to change direction 90°.

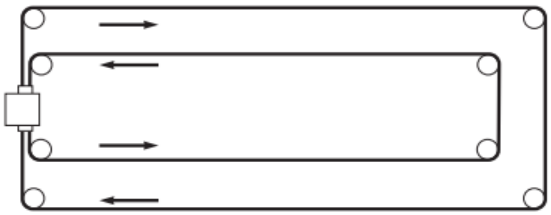

Fig. 1. The feeding system two line with two way drive
Source: Floor Chain Systems Catalog

The wheels in combination with synthetic bushes allow smooth operation even at speeds as showing in Fig .2

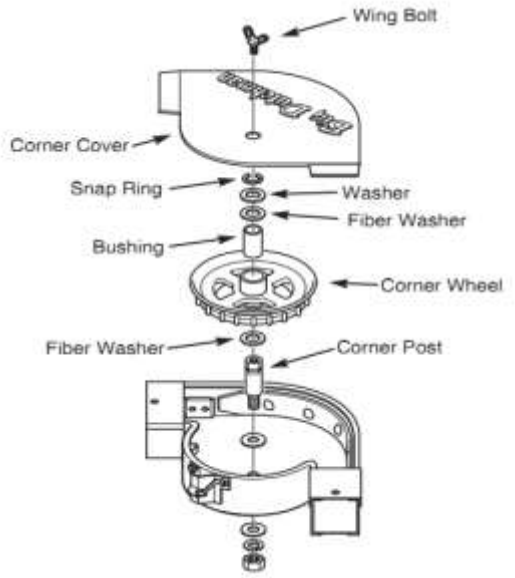

Fig.2. Corner wheel component's
Source: Floor Chain Systems Catalog

Fig.3 Bearing and coroner wheel
Source: Author's own illustration.

Fig.4.Corner wheel before and after wearing
Source: Author's own illustration.

Parameters under study

Test the chain feeder system before and after modifying under this factors:

-Chain feeder speeds three levels 25,30 and35m/min

-Opening feed area of three levels 18,27and 36 cm²

Measurements

-**Feed consumption** of 4,000 hens estimated daily 140 g./hen .

-Feeding rate of feeder defined as the total amount of feed per time

-Total amount of feed for one meter from feeder chain according to chain length 340 m. and hoppers capacity 200 kg, the ideal amount of feed for one meter from feeder chain was 1,680g/m

-Feeder efficiency (FC) can be calculated by**:**

FC=(total amount of feed /Ideal amount of feed**)**× 100

-Operating feeding time defined as the total time during operating feeding system to end the recommended feed for each hen

-Forage losses were estimated from standing chicks in trough during feeding process, chick legs on the floor. Also chain fails and hulling trough are other sources of forage loss.

-Wearing measurement. The amount of wear can be described by the absolute mass loss (in grams), or mass loss per unit (grams per time), also by a fractional change in the mass of the part involved. According to ASTM (American Society for Testing and Materials .)

-Power consumption, kW All motors were 380 – V, 3 – phase. the consumption measured by power meter

RESULTS AND DISCUSSIONS

Feeding rate

The relationship between feeder speed and feeding rate at different opening feed area on feeder when using external line of feeding system as revealed in Fig.1.

It clearly revealed that, the average of feeding rate increased when opening feed area on feeder and feeder speed increased to reach at maximum value with 95 kg/min at 35m/min feeder speed and opening feed area were 36 cm^2.

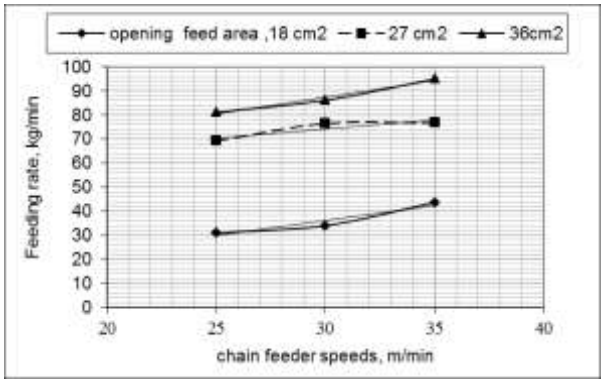

Fig.5. The effect chine feeder speed and the opening feed area on feeder feeding rate
Source: Author determination

Amount of feed on one meter

Fig.6 showing the effect chine feeder speed and the opening feed area on amount of feed on one meter from feeder chain.

The amount of feed on one meter from feeder chain decreased to 490g/m when increased chine feeder speed of 35m/min. at opening feed area were 36 cm^2 while the amount of feed on one meter from feeder chain increased to 1,620 g/m when decreased chine feeder speed to 25m/min. at opening feed area were 36 cm^2.

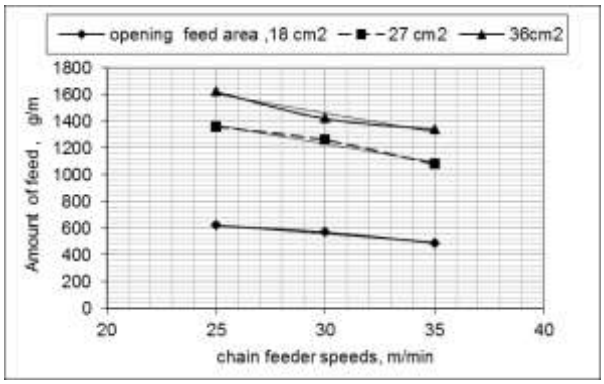

Fig.6. The effect chine feeder speed and the opening feed area on amount of feed on one meter from external feeder chain
Source: Author determination.

The operating time

The chine feeder speed and the opening feed area affected by operating time, the operating time ranged from 6.5 to 16.19 min. when increased the opening feed area from 18 to 36 cm^2 at 30 m/min feeder speed as showing in Fig.7.

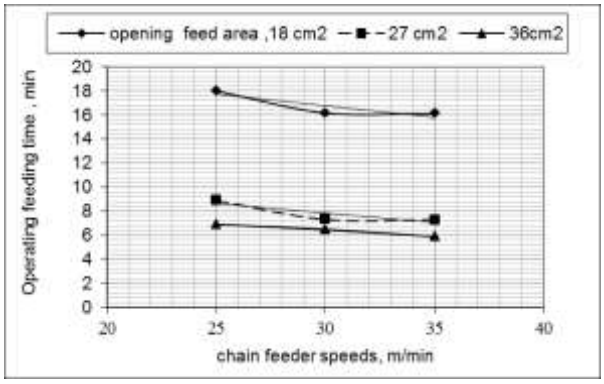

Fig.7. The effect chine feeder speed and the opening feed area on operating time
Source: Author determination.

The feeder efficiency

Fig.8 showing the effect chine feeder speed and the opening feed area on feeder efficiency.

The chine feeder speed and the opening feed area affected by operating time, the operating time ranged from 33.90 to 84.50%. when increased the opening feed area from 18 to 36 cm^2 at 30m/min feeder speed.

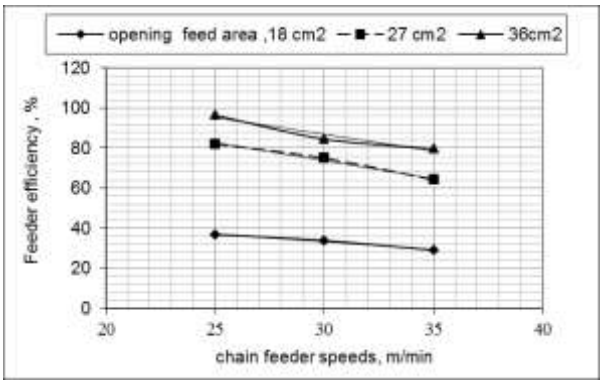

Fig.8. The effect chine feeder speed and the opening feed area on feeder efficiency
Source: Author determination.

The forge losses

Fig.9 and Fig 10 showing the effect chine feeder speed and the opening feed area on forge losses before and after modifying the forge losses decreased from 1,040 to 960, g. before and after modifying at opening feed area were 36 cm^2 and 30 m/min feeder speed.

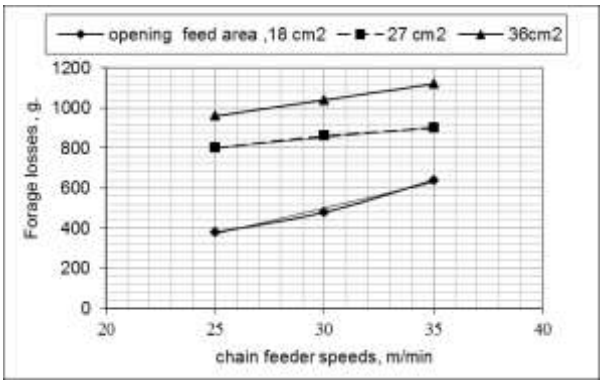

Fig.9. The effect chine feeder speed and the opening feed area on forge losses before modifying
Source: Author determination

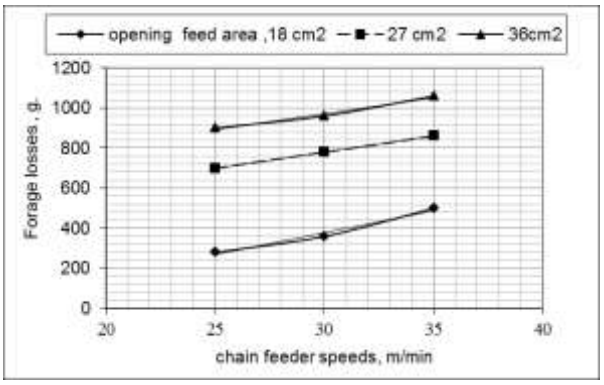

Fig.10. The effect chine feeder speed and the opening feed area on forge losses after modifying
Source: Author determination.

Wearing behaviour

Fig.11 and 12 showing the effect chine feeder speed and the opening feed area on wearing before and after modifying the wearing mass loss decreased from 67 to 26, g. before and after modifying at opening feed area were 36 cm^2 and 35 m/min feeder speed.

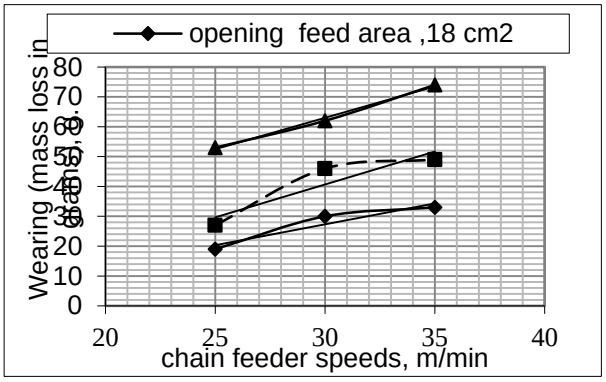

Fig.11. The effect chine feeder speed and the opening feed area on wearing before modifying
Source: Author determination.

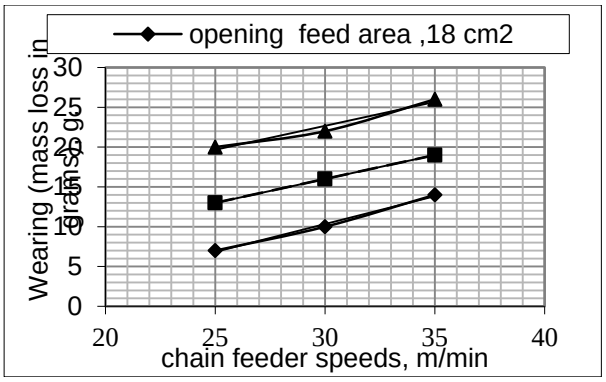

Fig.12. The effect chine feeder speed and the opening feed area on wearing after modifying
Source: Author determination.

The power consumption

Fig.13 and 14 showing the effect chine feeder speed and the opening feed area on power consumption before and after modifying also test power consumption with and without load, the power requirement with ordinary fillers before modified deceased from 1.089 to 0.941 kW with load and without load at 25 m/ min chain speed also deceased from 1.026 to 0.846 kW with load and without load at modified system. The feeder chine loses increased from 280 to 900 g. when opening feed area increased from 18 to 36 cm^2 .

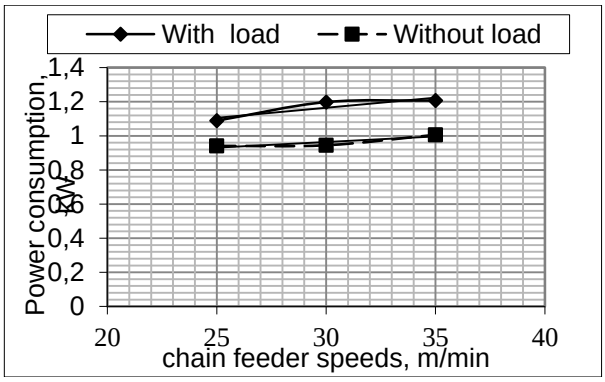

Fig.13. The effect chine feeder speed and the opening feed area on power consumption before modifying
Source: Author determination.

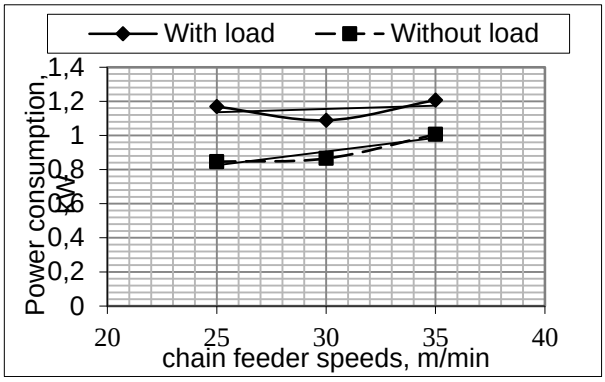

Fig.14. The effect chine feeder speed and the opening feed area on power consumption after modifying
Source: Author determination.

CONCLUSIONS

The main results of the present research can be summarized as follows:

-Using modified feeding system with chain speed.(25-30-35) m/min and opening feed area (18 -27 and 36 cm²). the optimum operating conditions for feeder system with chain speed 30 m/min and opening feed area 36 cm². Using modified feeding system can be

- reduce wearing between corner wheel feeder chine by 61%.
- reduced the average The feeder chine loses by 7.61% .

-reduced the power requirements by an average of 5.78%.

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