



The Benefits of Floor Feeding (for Optimal Uniformity)

Greg Hitt, International Technical Service Manager, Asia

SUMMARY

A well-managed floor feeding system provides a range of benefits for bird welfare and flock performance, in particular when spin feeders are used. Achieving the optimal uniformity of parent stock using a floor feeding system can be accomplished by following management techniques such as maintaining correct litter depth and quality, ensuring proper feed pellet size and texture, managing lights and drinkers, and providing accurate feeder placement. Floor feeding, if properly managed, can have welfare and production advantages over other feeding systems, including increased feeding time and foraging behavior, flock uniformity, reduced labor, the ability to make individual feed decisions, and increased population density. To make certain that you are getting the desired performance results out of your flock when floor feeding, there are a few main points to remember:

- The ideal maximum population size per spin feeder is approximately 1,500 birds for females and 1000 for males.
- Litter depth should be no more than 4 cm (1.5 in) to prevent loss of feed.
- The ideal feed clean-up time should not be less than 30 minutes.
- Vaccinate the flock for coccidiosis since birds will be feeding from the floor.
- Wait at least 5 days after the birds have settled into the floor feeding system to grade them.
- Routinely check crop fill, bird behavior, and pen uniformity.

By implementing the management techniques presented in this article, it is possible to benefit from the advantages of floor feeding while achieving and maintaining target flock uniformity.

This is a global technical document aimed at providing optimal welfare and production conditions - local legislation and guidelines should be adhered to.

The remainder of this article provides more detail on the points summarized on page one.

INTRODUCTION

Floor feeding during the rearing period by use of spin feeders offers a number of advantages over pan or track systems, provided the spin feeders are managed appropriately. Spin feeding allows prolonged feeding time and feeding related behaviors. Furthermore, if using a sufficiently hard pellet with a well-managed system, spin feeding can provide a few additional advantages such as improved flock uniformity, possibly reduced labor inputs, and increased population density as the birds can utilize the space otherwise occupied by the feeding system. Additionally, individual feed volume decisions can be made per pen when using spin feeding systems, which can be a limitation of a whole house system such as pan or track feeders.

As with any feeding system, speedy delivery of feed in a uniform manner, allowing all birds to feed at the same time, will help to improve flock uniformity. When considering best practice for spin feeding, there are a number of critical control points and management considerations that must be observed in order to achieve the best possible results. Key factors to consider include the following:

- Population density.
- Litter quality and depth.
- Feed texture / pellet quality.
- Timing of key events (grading, vaccination, etc).
- Management of lights and drinkers.
- Coccidiosis control.
- Equipment design / layout.
- Measures of success.
- Local legislation and professional guidelines.

BENEFITS

Floor feeding increases the feeding time and foraging behavior of the birds, which has beneficial effects on bird welfare. When managed correctly, the uniformity of the flock will also improve, the required labor to manage the flock may be reduced, and the floor space in the house may be used more efficiently as more space becomes available that would otherwise be utilized for the chain or pan feeding system.

Since achieving correct available feed space is often the first limiting factor when considering population density, opting for a floor feeding system may allow for increased bird numbers without affecting flock uniformity.

When using floor feeding, it may be possible to place birds at a higher stocking density when compared to other feeding systems, as long as local legislation regarding stocking density is adhered to. A 14 m (45.92 ft) wide house should have pens placed at 14 m (45.92 ft) intervals down the length of the house, with a single spin feeder located in the center of each pen. This gives 196 m² (2,109 ft²) per pen. At an Aviagen® recommended stocking density of 7 female birds/m² (2.7 ft²/bird) or 4 male birds/m² (3.6 ft²/bird), this will be equal to 1,372 female or 784 male birds per pen at placement. Floor feeding systems can easily cope with this number of birds without any trade-off in uniformity.

If we compare the same 14 m (45.92 ft) wide house, but this time with a track system for feeding, the volume of track feeder space may become a limitation if feeders cannot be suspended off the floor when not being used. This is important because total available floor space will be lower, leaving less space for bird activity, the use of perches, etc., when compared to spin feeding systems. A track that is 118 m (387 ft) long and 10 cm (4 in) wide will take up an area of 12 m² (129 ft²). This represents a relative reduction in available floor space of 12 m² (129 ft²). Actual available floor space is therefore reduced to 184 m² (1,981 ft²). Based on the recommended stocking density, this gives an ideal total bird number of 1,288 female or 736 male birds if uniformity is not to be compromised. A similar situation may occur when comparing floor feeding with pan feeders, if they also cannot be raised when not in use. As a general rule, place a maximum of 1500 females and a maximum of 1000 males per spin feeder.

LITTER QUALITY AND DEPTH

Litter quality and depth are both important factors to ensure optimal feed presentation during feeding with a floor system. Ideal litter depth should be around 4 cm (1.5 in), depending on the type of house floor (dirt or concrete), so as to allow birds to scratch litter aside to find all feed that has been spun onto the floor. Although scratching to forage for food is a natural behavior, litter depths exceeding 4 cm (1.5 in) make it more difficult for birds to find feed. When using concrete floors, (which should be brought to 28-30°C (82-86°F) before distributing the litter material), applying 2 cm (1 in) of litter material in the beginning works well to keep the litter dry and friable. It is also important to practice good drinker management to keep the litter dry while allowing the birds to have ample access to water.

Wood shavings are an optimal form of litter material for floor feeding. Under good environmental management, the wood shavings break down to a fine powdery dust, allowing the feed pellets to become well contrasted against the darker, powdery litter, aiding visual cues for the presence of feed (**Figure 1**). Rice hulls and similar materials are not suitable for floor feeding systems due to their inability to break down, and the similarity in size

Figure 1: Good feed contrast against wood shavings as bedding material.



FEED TEXTURE AND PELLET QUALITY

Key elements to consider:

1. Pellet durability.
2. Fines percentage.
3. Feed texture.

Pellet Durability

Pellet durability index (PDI) is an important aspect of pellet quality. A lower PDI score will result in increased breakages of the pellet as the feed is transported from mill to farm, then into house, and finally into the spinner hopper. This results in excess dust which will be lost to the house environment. A standard measure of pellet durability is the Holmen tester (**Figure 2**), which is used in many feedmills. The Holmen test consists of subjecting finished feed pellets to a specified period of agitation, followed by sieving, and then determining the percentage weight of the pellets. The percentage weight of pellets that remain in the screen indicate the Holmen score. For floor feeding, PDI should be greater than 85% after a 2 minute Holmen test.

Figure 2: Holmen PDI Tester.



The choice of raw material plays a significant role in final pellet durability. Wheat based diets typically offer a much higher PDI due to the gelatinization that occurs with wheat during the conditioning and pelleting process. Corn based diets can deliver sub-standard durability levels due to a lack of gelatinization. Where corn is predominately used, 30% ground wheat may be added to the diet to produce a sufficiently durable pellet for floor feeding. Where wheat is not available, pellet binders can be added to the diet, but at added cost. Other factors such as grist size, conditioner temperature / steam application, die size, fat addition, and cooling can all influence pellet durability.

Fines Percentage

Feed for floor feeding should be produced with as minimal fines as possible. Feed should be sieved at the feed mill, post-pelleting, as standard practice with the fines being returned to the conditioner for re-pelleting. Levels of fines can increase due to a number of manufacturing issues within the feed mill, such as sieve blockages, a change in raw materials, or in manufacturing process (i.e. percentage of fats or oils added in the mixer relative to post pelleting). Feed quality at farm level should be closely monitored and any changes reported back to the feed mill. This can be done by using a shaker sieve similar to the one pictured below (**Figure 3**). Pellet durability and fines levels are obviously closely interrelated. The process of transferring finished feed from the feed truck to the farm storage bin may also result in a breakdown of pellet quality, depending on the PDI.

It may also be beneficial to sieve feed upon arrival to the house, prior to weighing-up and distributing to individual spin feeder hoppers (**Figure 4**). This allows for final quality control over the level of fines present in the feed closest to the point of distributing the feed to the birds.

Figure 3: Example of a shaker sieve.

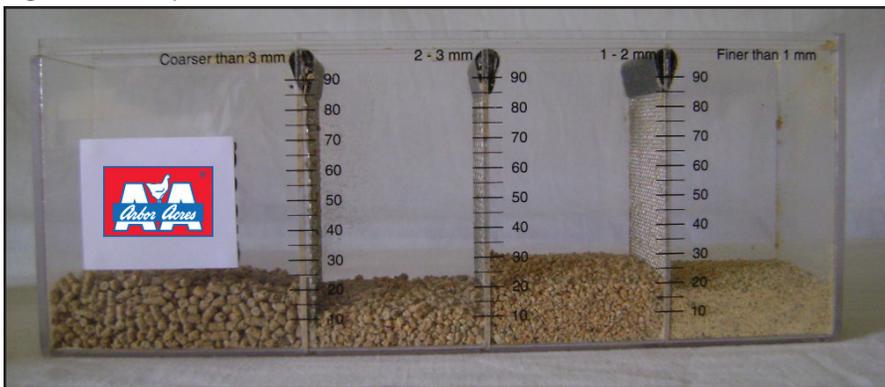
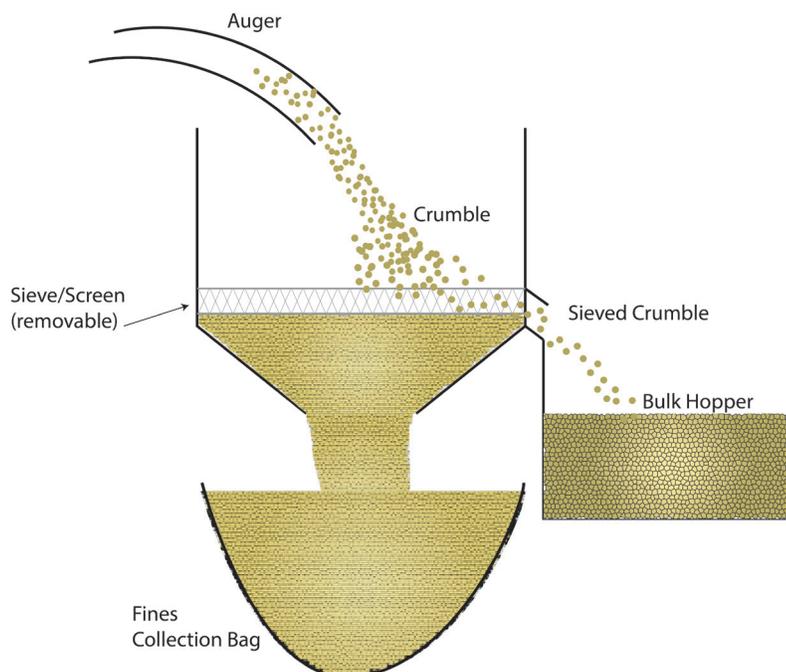


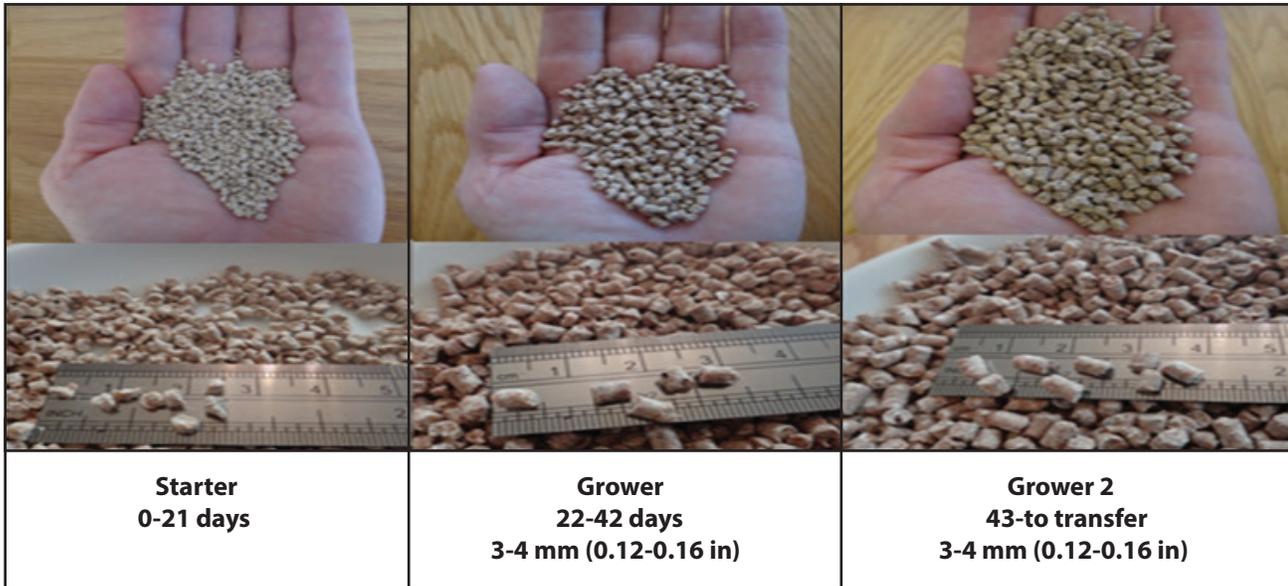
Figure 4: Sieving feed on farm before it enters the hopper to reduce percentage of fines presented to the birds.



Feed Texture

Feed clean-up time can influence the uniformity of the flock. Too quick a clean-up time will result in variable feed intake between individual birds, creating uneven populations. Ideally, feed clean-up times should be between 30 and 45 minutes with floor feeding systems. However, with spin feeders, feeding time can be as low as 15 minutes. To help with this, it is desirable to keep the pellet size as small as possible to lengthen clean-up time, while not compromising the amount of fines present in the feed. Where a good PDI is achieved (>85%), grower feeds can be cut at 3-4 mm (0.12-0.16 in) length and slightly crumbled for birds that are between 22- 42 days of age. From 43 days, grower feed should be presented as a short-cut pellet of 3-4 mm (0.12-0.16 in) in length with no crumbling (Figure 5). If using a pre-breeder diet from 15-16 weeks of age until transfer, this should also be a 3-4 mm (0.12-0.16 in) pellet. Pellet lengths greater than 5-6 mm (0.20- 0.23 in) should be avoided if clean-up times are below 30 minutes.

Figure 5: Desirable progression in feed texture for floor feeding.



If pellet length has been reduced as far as practically possible, and clean-up times remain too quick to the point uniformity is negatively impacted, diet formulation should be reviewed with the possibility of creating a less nutrient dense diet, so more feed can be fed on a daily basis without compromising body weight and uniformity.

TIMING OF KEY EVENTS

A key consideration when floor feeding with spinners is the timing and management during introduction of the automated system. Movement to the automated feeding system must be made gradually. The first major grading of birds should occur following introduction of the spin system to allow for any deviation in body weight that may occur as a result of this transition. It is best practice to allow a minimum of 5 days following completed transition from hand to spin feeding before attempting the first major grade to allow birds to settle into the new feed delivery system. Daily feeding with spin feeders work very well as birds are able to spend time actively feeding.

The next table represents the approximate timing of key changes with respect to feed type, feed texture, feed placement, spinner throw diameter, and grading (**Table 1**).

Table 1: Timing of key changes.

Age		Feed Type / Texture	Feed Tray Placement / Spinner Throw	Feed %				
Weeks	Days			Hand		Spinner		
				Tray	Floor			
	0	Starter - crumb	Feed trays in brood surrounds.	100%				
	1			100%				
	2				100%			
	3				100%			
	4				100%			
	5				100%			
	6				100%			
1	7				100%			
	8				100%			
	9				100%			
	10			Birds released from surrounds. Full pen access within.	100%			
	11		Feed trays spread evenly around pen.	100%				
	12			100%				
	13			100%				
2	14			100%				
	15			100%				
	16			90%	10%			
	17		Begin moving feed trays gradually towards spin feeder.	80%	20%			
	18			70%	15%	15%		
	19			60%	10%	30%		
	20		Feed trays now all located within 3 m (9.8 ft) radius of spin.	50%	5%	45%		
3	21	Grower - coarse crumb, short cut, or mini-pellet		25%		75%		
	22		Remove 1/5 of feed trays.			100%		
	23		Remove 1/5 of feed trays. Spinner set to 3 m (9.8 ft) diameter.			100%		
	24		Remove 1/5 of feed trays.			100%		
	25		Remove 1/5 of feed trays. Increase spinner throw to 3.5 m (11.5 ft) diameter.			100%		
	26		Remove remaining feed trays.			100%		
	27		Spinner achieving 4 m (13 ft) throw.			100%		
4	28					100%		
	29						100%	
	30						100%	
	31						100%	
	32						100%	
	33						100%	
	34						100%	
5	35						100%	
	36				Gradually increase spinner throw while maintaining population density for age.			100%
	37				Achieve full throw of spinner by around 6 to 7 weeks.			100%
	38						100%	
	39						100%	
	40					100%		
	41					100%		

1  2  3  4  5

5 days with 100% spinner feeding prior to grade

  **Grade birds**

TRANSFER

Another key consideration when floor feeding with spinners in rear is the transition from spin feeders to pan or track feeding during production. Feed should be available in the production feeding system immediately upon arrival of the birds to the production farm. This will help the birds to find feed in the new feeding system. Within the first 24-48 hours, the track or pan auger should be run on a regular basis throughout the day to help the birds associate the sound of the running auger or track with feeding time. The flock should be monitored closely to assess feeding behavior, ensuring that all birds are eating simultaneously. If transferring into a slatted production house, it may be necessary to pen the birds on the slats where the feeding and water systems are located for the first 24-48 hours.

MANAGEMENT OF LIGHTS AND DRINKERS

All birds should be able to eat uniformly.

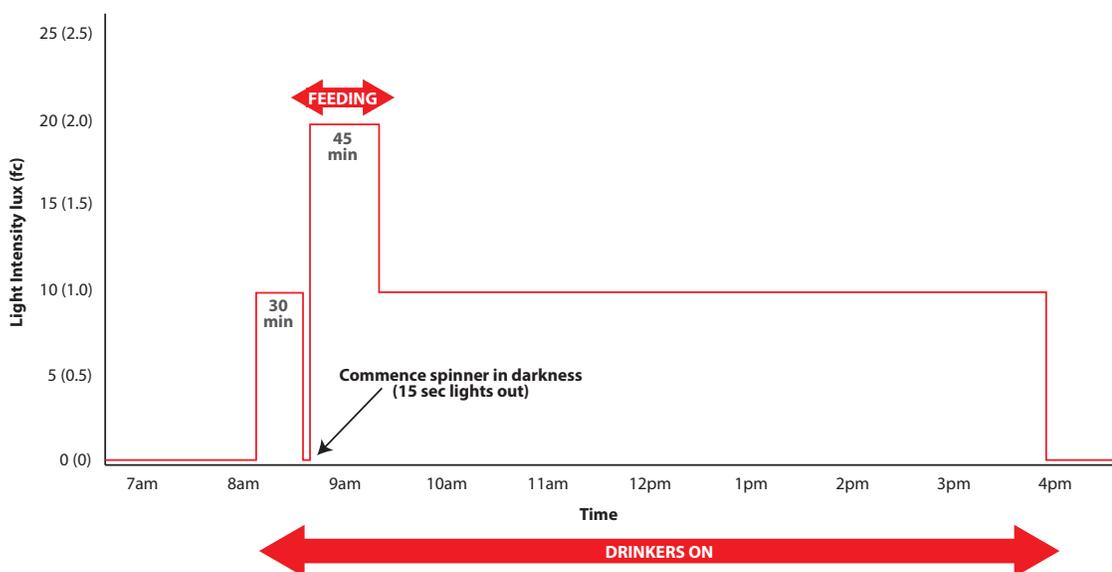
If the "lights on" time is too close to feeding, the birds can become agitated, displaying circling behavior as they develop an association with lights on and feeding. This elevated activity immediately prior to feeding can be counter-productive to the birds quickly settling into a desirable feeding pattern. In order to disassociate the initial "lights on" period with feeding, it is best to provide a suitable time period of around 30 minutes where lights are on at normal "day time" intensity, allowing birds to wake and drink if required.

In most situations, normal "day time" lighting will see house light intensities operate somewhere between 10 and 20 lux (1.0-2.0 fc) (Figure 6). During the first 3 weeks, light intensity of 20-30 lux (2.0-3.0 fc) is advised for the duration of feeding to assist in uniform feeding activity. Afterward, birds can easily find the feed at 10-20 lux (1.0-2.0 fc). Birds may remain quieter when no variation in light intensity occurs during the day. Variation in light intensity might set-off the occurrence of feather pecking. Once all feed has been eaten, lights should be returned to normal "day time" intensity levels.

Additionally, it may also be beneficial to switch off lights immediately prior to starting the spinners, allowing them to run for 15-20 seconds in darkness before switching lights back on. This allows for an initial volume of feed to spread out in darkness, assisting the speed at which birds settle into a desirable feeding pattern as soon as the lights are switched back on. Coordination of lights and spinner switching can be easily managed through the use of electronic timers, simplifying the operation to a single button push. Intensity can then be increased manually as soon as the lights come back on for feeding.

Birds should be routinely inspected to ensure the adequate supply of water. If there is sufficient water intake, it should not be possible to feel pellets when massaging the crop in any birds. If whole pellets can be felt, insufficient water has been provided which will negatively impact the digestion process and ultimately, flock uniformity.

Figure 6: Suggested lighting management for floor feeding.



COCCIDIOSIS CONTROL

Due to bird's feeding from the floor, careful management of coccidiosis is required. An approved vaccine should be used, with manufacturers guidelines closely followed in the preparation, administration, and subsequent management, to prevent any undesirable coccidiosis breaks within the flock.

EQUIPMENT DESIGN / LAYOUT

The house should ideally be divided into equal pens based on the width of the house. A single spin feeder should be located centrally to the individual pens. There are a number of different manufacturers and designs of spin feeders. Some are fixed position (**Figure 7**) and filled by a central auger that runs the length of the house. Other types are mobile (**Figure 7**), either on a stand or monorail that allow for fill in a central location before moving into position for feeding. In all cases, care should be taken to ensure the spin feeder is central to the pen and that the pen is as square as possible (**Figure 8**). Equipment such as slats or divider frames should not be placed in the direct path of the feed as this will cause uneven feed distribution, resulting in poor uniformity.

In order to facilitate the transfer from a spin feeder system in rear, to track or pan feeders during production, with a partly slatted area and drinkers on the slatted area, it is essential to provide a slatted area or perches during the rearing period so that the birds get accustomed to moving in multiple planes. This also has the benefit of helping to reduce floor egg levels during the production period. Ideally, at least some of the nipple or bell drinkers should be placed at an elevated level above the slats. This should be done at no later than 28 days of age.

It is ideal that the feed is distributed evenly across the entire throw diameter (**Figure 9**), as any variation in feed volume will also create variable feed intake between individual birds, leading to poorer flock uniformity.

Figure 7: Example of a fixed system filled by a central auger (left) and a mobile spin feeding system (right).

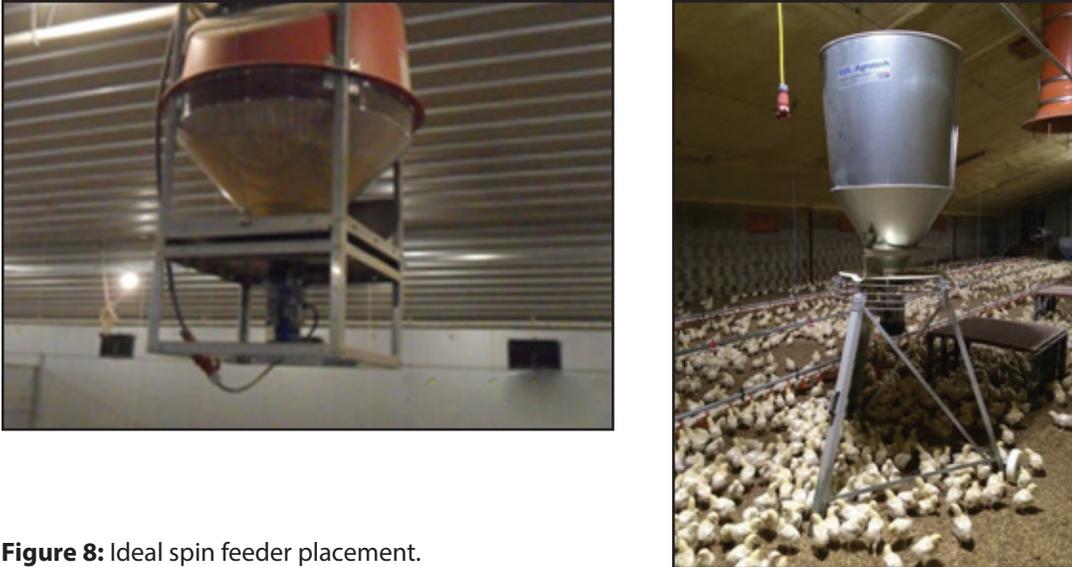


Figure 8: Ideal spin feeder placement.

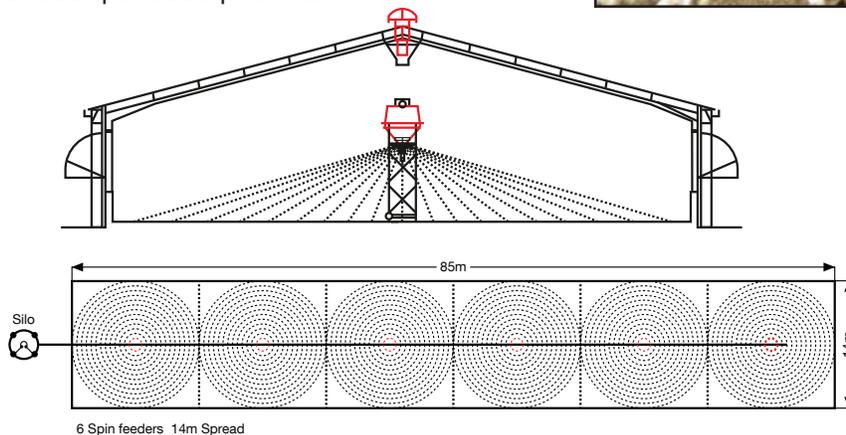


Figure 9: Distribution of birds during feeding when the ideal feed throw occurs.



MEASURES OF SUCCESS

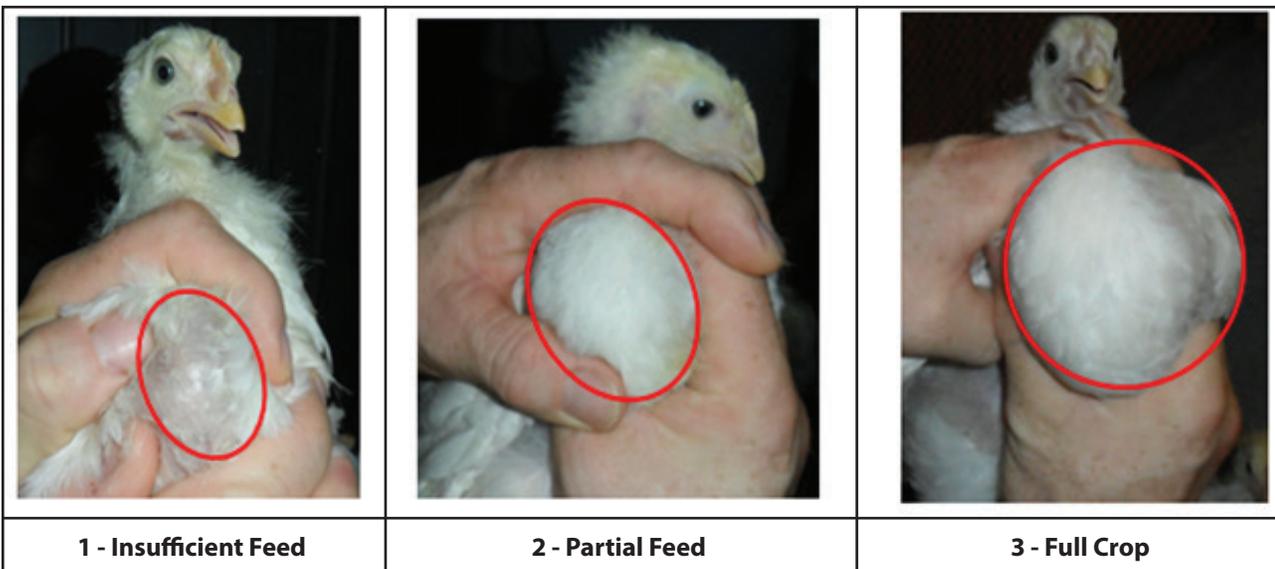
Key measures of successful floor feeding are:

1. **Feed clean-up time:** Regularly monitor and adjust feed texture if clean-up is too quick (<30 minutes), as this can negatively impact uniformity.

2. **Crop fill:** It is good practice to routinely monitor evenness of crop fill after feeding and drinking has completed to provide feedback as to effectiveness of the feeding process. Birds should be penned as if conducting a sample-weigh, ideally within 2 hours of feed delivery. Crops should be felt and scored as 0: Empty, 1: Insufficient feed, 2: Partial feed, 3: Full feed (**Figure 10**). Corrective actions should be investigated immediately if a sub-standard result is obtained (15% of birds do not have a full crop).

- Too wide a feed throw will lead to variable bird density within the feed area, resulting in variable crop fill and uniformity problems.
- Too tight a feed throw will create agitation during feeding and unnecessary competition, resulting in variable crop fill and uniformity problems.
- Just right: Feed throw is gradually adjusted as birds' age so that birds are always held in a uniform circle when feeding. Adequate space is provided so that birds can feed in a calm, uniform manner. Crop fill is even and flock uniformity is optimized.

Figure 10: Example of crop fill measurement.



3. **Flock uniformity / Coefficient of variation (CV) for age:** After the birds have been graded, uniformity should not worsen. Any drift in uniformity post-grading will require investigation as to the root cause. Issues with feeding that lead to variable feed intake is a key area to investigate when uniformity is poor.

4. **Bird behavior:** In addition to measuring the above criteria, it is also very important to regularly observe bird behavior during feeding time to ensure there are no physical problems occurring that may be impacting uniformity.

SUMMARY

The following are the summary key points when floor feeding:

- Ideal maximum population size per spin feeder is around 1,500 female or 1000 male birds.
- Litter depth should ideally be no more than 4 cm (2 in) to prevent loss of feed.
- Clean dried wood shavings are an ideal source of bedding material for floor feeding.
- Pellet durability: Target a 2 minute Holmen test score >85% .
- Pellet durability: Wheat based diets deliver superior pellet durability.
- Lengthen feed clean-up time by manipulating feed texture (i.e. communication with the feed mill). Ideal feed clean-up time should not be less than 30 minutes.
- If using pens within the house, these should be exactly square to ensure spin feeders are placed centrally within the pen.
- Avoid placing equipment that may disrupt feed distribution within the throw of the spinner.
- Install perches or provide slatted area with drinkers from 28 days onwards.
- Feed distribution must be even across the entire diameter of the throw zone.
- Vaccinate stock for coccidiosis.
- Wait at least 5 days to grade the flock after the birds have settled into the spin feeding program.
- Ensure all birds have sufficient access to water.
- Lights should be managed effectively to allow optimum feeding behavior.
- Routinely track crop fill, feed clean-up time, and pen uniformity as well as regularly observe bird behavior during feeding to ensure optimum uniformity.