



Examining the pelleting system

A properly designed and sized pelleting system is essential for producing quality finished pelleted feeds

by Fred Fairchild

This is the second article in a two-part series on the pelleting system. The first article, published in the February issue of *World Grain*, covered the system from the mash supply bins through the pellet cooler. This article will cover the rest of the system. After cooling, the pellets may be crumbled, screened, coated with additional liquid or sent directly to bulk or bagging bins.

PELLET CRUMBLING

Whole pellets are often considered too large of pieces for infant animals to handle within their digestive systems. Whole pellets are broken into smaller pieces by passing them through a specially designed roller mill to cut the pellets into smaller pieces. The cutting action occurs because one roll turns faster than the other and the rolls are grooved with special corrugations, creating a cutting action. The difference in the roll speeds is known as “speed differential.” It is determined by dividing the speed of the fast roll by the slow roll. The speed differentials range from the fast roll turning 1.3 to 1.5 times faster than the slower roll. The size of the crumbled pieces is dependent on space “gap” between the two roll surfaces. The smaller the gap between the roll surfaces, the more severe the crumbling action resulting in smaller pieces.

Crumbling rolls are installed immediately below the discharge of the pellet cooler. The system must include a method to bypass the rolls when crumbling is not needed for the pellets. Crumblers located at the discharge of horizontal coolers are the same width as the discharge outlet of the cooler. The pellets are discharged from the cooler in a constant uniform curtain falling into the crumbling rolls. This discharge pattern allows the rolls to be uniformly fed at a continuous curtain completely across the roll length.

Crumbling rolls located under counterflow coolers require a feeder roll to spread the pellets uniformly across the length of the crumbling rolls. This is required because counterflow coolers discharge in small, non-uniform batches of cooled pellets. The same problem exists for conveyors and bucket elevators being fed by a counterflow cooler. They must be equipped to receive the cooled pellets through non-overloading inlets such as bypass inlets on conveyors.



Bühler's crumbler/cracker DFZL is used for crumbling feed pellets. Photo courtesy of Bühler.

SCREENING

Most mills producing pelleted feed for commercial use or sale screen the pellets and/or crumbles to remove undersized particles or fines created in the pelleting and cooling process for recycling back through the system. This leaves a finished product that is virtually free of broken pellets or fines. It allows the mill to deliver properly sized pellets that indicate quality to purchasers. In integrated operations, pelleted poultry feed is seldom screened while swine feeds may be screened to minimize fines. Spouting to screening systems should also be designed to include valves and spouting to bypass the system when screening is not needed.

Screening is accomplished by passing the pellets over wire or perforated metal surfaces that vary in opening size depending on what type of screening is to be done. A single screen unit separates fines and smaller particles from the whole pellets. This screen opening size is slightly less than the diameter of the whole pellets. The whole pellets stay on the screen while passing through the screener, but the finer parts fall through the screen and are reclaimed for recycling back through the system. If additional separations are required during the screening pro-

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FEED OPERATIONS

cess, additional decks are added to the screener.

The table below shows different screening processes that might be done with addition of different size screen materials on each deck.

Number of decks	On top screen	On middle screen	On bottom screen
Single deck	Pellets		
Double deck	Pellets	Crumbles	
Triple deck	Large pellets (Range cubes, etc.)	Pellets	Crumbles
Bottom pan	Fines	Fines	Fines

POST PELLETING LIQUID COATING

Many feed manufacturers are asked to apply liquid coatings to finished whole pellets. This is done after screening of the pellets. These liquids are normally added just prior to putting the pellets into bagging or bulk storage bins. If high additional amounts of liquid are to be applied, the application may be done after the finished pellet bins just prior to bagging or loading into bulk delivery trucks.

Post pelleting liquid coating systems use either batch or continuous type application systems. Batch systems use a

hopper scale to accumulate the amount of pellets to be coated. A second liquid batch scale or mass-flow liquid meter is used to weigh up the amount of liquid to be applied to the pellets. Both the pellets and the liquid are then discharged into a mixer and blended until liquid is fully absorbed into or coats the pellets. The pellets are then transferred to a bagging or bulk storage bins or direct loading system.

A continuous application system applies liquid at a specific rate to the continuous flow of pellets. To do this accurately, both flow rate of the dry material (pellets) and flow rate of the liquid(s) must be measured constantly. Accuracy of this application system is based on being able to obtain the actual flow rates of both the pellets and the liquid. The most accurate flow measuring devices for both are mass-flow weighing devices that sense the actual mass of material flowing through each meter. The liquid addition rate is tied to the dry material flow rate through a computer, usually as a percentage of liquid to be added to the dry material level required.

FINISHED PELLET BINS

The finished pellets are delivered to storage bins for retaining until they are bagged or loaded out in bulk. The individual capacity of the bins is normally determined by the size of shipment

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or manufacturing lot sizes. Specific bins should be identified for storage of medicated feeds or feeds with high moisture or fat content. This keeps these products from contaminating or leaving residues in other bins. Like mash bins, discussed in my article in the February issue, these bins should also be filled vertically at their centers and designed with mass flow hoppers.

LAYOUT TIPS

When designing a pelleting system, the following suggestions should be kept in mind for physical layout:

1. Provide access on all sides of a piece of equipment to service it.
2. Provide sufficient room and clearance to completely open service doors to allow access and changes for dies, screens, etc.
3. Provide clearance behind motor cooling fans to allow sufficient motor cooling air movement.
4. Minimize the number of conveyors

or bucket elevators used in the system. Stack and use gravity as much as possible.

5. Use drag or belt conveyors to convey pellets to minimize damage to pellets.

6. Use low speed bucket elevators that minimize the amount of impact created at their discharge point.

7. Use stainless steel construction for all metal that comes in contact with wet or sticky pellet or air streams.

SUMMARY

The pelleting system production rate is based on throughput capacity at the pellet die. The die throughput varies by formulation, mash particle sizes, moisture addition, and pellet size and length. Capacities for all other equipment in the system must support the pelleting capacity.

Motors should be sized to operate at 85% or higher loading in normal production to get the best efficiency out of motors. The feeder to the conditioner requires

a variable speed drive to control input rates of mash to the pelleting system.

The addition of variable speed drives on the conditioning units and the main pellet mill drive motor will allow better control of these pieces of equipment and allow for adjustments that will make the system produce good pellets efficiently. Automation of the complete system will also control efficiencies and pellet quality. A properly designed and sized pelleting system is essential for producing quality finished pelleted feeds. **WG**

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