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ANIMAL FEED PELLETING

Compound feeds are mostly employed in the animal feed business as pellet feed and mash feed. In recent years, due to its simple transportation and good economic efficiency, animal feed pellets have become an increasingly popular choice among animal feed investors.

THE HISTORY OF ANIMAL FEED PELLETING

For centuries people allowed their pigs and chickens to forage and occasionally tossed them some food scraps. The industrial revolution changed that.

Farmers now needed horsepower. Horses that supplied power needed high energy feeds. Horses that provided transportation needed feeding stations along the way. Horses that went to war had to carry their feed with them.

The British developed the first compound feed as transportable nourishment for war horses. The feed, resembling a large baked biscuit, was a combination of meal from oat, peas, rye, flax, wheat or maize. According to feeding experiments done by the Prussian army, 1.5 kg (3 3/8 lb) of this compound horse feed could substitute for 5 kg (11 pounds) of oats.

Concentration of food processing, particularly large flour mills, created a new environmental problem: These mills (conveniently built close to water) began dumping waste into rivers and streams.

As tons of wheat midds fouled the waters, the government intervened and prohibited dumping by law. The midds had nutritional value for animals but did not flow well, had low bulk density, dusty texture and, therefore, were not pleasant to eat. Whey generated by cheese production, and meat and bone meal from the packing plants were equally problematic.

In 1928, the needs for efficient animal feeds, and use of industrial food wastes were both brilliantly satisfied when Purina began pelleting flour mill waste. Wheat midds were mixed with animal by-products or soya cake, plus ground corn and minerals, and compressed into convenient pellets. The obvious advantages were:

- Less dust
- Increased bulk density
- Improved flow ability
- Improved palatability
- Reduced feed wastage
- Increased consumption rate
- Less energy expended in consumption
- Dense minerals did not segregate out

WHAT IS PELLETING?

Pelleting is the process of converting finely ground mash feed into dense, free flowing pellets or capsules. When we say “pelleting”, we refer to the process of compressing materials through a die to form a cylindrical shape with a length that is generally 2–4 times its diameter.

HOW ARE PELLETS MADE?

In the simplest terms, you can make pellets by pressing a feed mixture through a circular hole in a piece of metal. If you drill a hole in a piece of metal, put some feed on it, then drive over it with your car, you would make a pellet. If you drill many holes, you can make many pellets. If you drill the holes in a circle, put the wheel on a shaft enabling it to drive around, and continuously place meal in front of the rolling wheel, you would create the flat die press.

However, you are left with a challenge: The wheel, or roller, travels faster on the outside of the die than on the inside. This may impact the quality of the pellet and cause the press to wear unevenly. To improve the process, form the die into a ring with the roller set inside it. Initially, the roller was powered, and the ring just coasted underneath it. This technology was similar to the flat die, except now both the roller and the die were moving, leading to a more positive extrusion. Today, the ring die is the driving power and the roller(s) coast inside.

ANIMAL FEED PELLET PRODUCTION LINE PROCESS AND TECHNOLOGY

Animal Feed Production Technology Plays a Vitally Significant Role in Animal Feed Milling Plant

Therefore, for investors planning to set up their own feed processing plant business, it is the best choice for companies with many years of experience in producing and selling animal feed pellet production equipment!

That is to say, if you are interested in animal feed production, please choose a feed production machine supplier who has experience and production technology for your purchasing.

Animal feed pelletizing systems are made up of a variety of machinery, such as crushers, mixers, pelletizers, coolers, packers, and so on, all of which are designed to accomplish the granulating operation as efficiently as possible. We will provide more detailed details on each machine's function eventually.

- **Pre – Cleaning & Dust Collection**

The first step in pelleting is conveying ingredients from bulk silos or godown to the batching bins. It is essential to remove oversize foreign materials and iron trash etc. which otherwise can affect the functioning of slide gates, gravity /screw feeder in batching or downstream. Pre-cleaning machines generally include rotary sieve, jute remover, magnetic catchers, etc. In automatic plants, it is desired that system is designed to give continuous efficient cleaning at a maximum flow of ingredients.

- **Grinding**

  After batching, the next step is to reduce the material to the required degree of fineness to have maximum surface area for exposure to heat and moisture to accomplish gelatinization in conditioners.

  In pelleting process grinding and pelleting are two major energy-consuming operations.

  If we can perform fine grinding with a minimum of energy, it will not only cut grinding costs but also save on the energy required in pelleting.

- **Batching**

  In modern plants, automatic weighing of different materials as per formulation to make one batch is called batching or proportioning. In this, any no. of silos of suitable capacity as per the total capacity of the plant, are incorporated and are having gravity or screw feeders for controlled discharging of material into weighing bin underneath it. Generally, two sets of bin or silos are installed - one for major ingredients, second for minor ingredients. The discharge of both weighing bin come into common surge for further processing. Bin vibrator or shaking devices are installed on some or all of the bins to make the material flow in case of jamming of the bin.

  The weighing is done through an electronic controller working on PLC or microprocessor-based, which can be operated through a computer. The computer control and record all the detail of a batch- over or under weighing of ingredients from set point, reporting on each batch, shift, day, weak, monthly basis. The generally desired features of a batching system are:

  It should give accurate weighing within the specified time to meet the output of the plant.

  Though it should be highly reliable and work automatically, it should have manual control also in case of auto failure.

- **Mixing**

  Efficient mixing of micro-ingredients in a whole batch is significant in making quality feed. The designed features of a good mixing system are.

  It should perform mixing to achieve a minimum coefficient of variation in minimum time.

  The mixer discharging mechanism should aim at no leakage of gates with minimum residue in the drum to avoid carryover to the next batch.

- **Conditioning & Pelleting**

  Conditioning is done to add heat and moisture in mixed feed to achieve gelatinization and making the product more pliable for pelleting. An ideal conditioning system should meet the following:

It should raise the temperature and moisture of the product by direct or indirect heating.

It should give desired retention time in conditioners.

After conditioning, the product is passed through a die-in pellet mill with the help of rollers and powdery material is converted into pellets. The quality and output of pellet mill is dependent on so many parameters, like;

Quality of grinding, conditioning, Formulation of feed: - (percentage of oil, protein, fiber, etc.), Die configuration: - Deciding working on the product in pelleting.

- **Crumbling**

Crumbling is a process in which a pellet after cooling is broken into small pieces to make it suitable for small chicks. If not required it can be bye-passed and the product escapes from the side of crumbling rolls. A well-designed crumbler should have the following features:

- Should give the uniform size of crumbs at both ends of crumbling rolls.
- Should break the material without making many fines.
- Should have a mechanism for equal gap adjustment on both sides.

- **Screening**

Product coming out of crumbler is either in pellets (if crumbler bye passed) or crumbs form. These are required to be screened to remove fines and overs. Single-deck screeners are used to removing fines only while double deck screeners are used to removing both fines and overs. The unbroken or the overs are returned to crumbler and fines return to the pelleting line for re-pelleting.

- **Bagging**

After the screener, the finished product is filled into bags. In small to medium plants, bagging can be carried out manually but for higher output, it is better to go for an electronic bagging machine.

WHAT IS PELLET QUALITY, AND HOW DO YOU MEASURE IT?

Animal feed pellet quality can be affected by various factors, mainly from the formulation of animal feed pellets as well as the feed pellet production process and technology. Pellets should maintain their shape until the animal eats them. There is a lot of handling

and transport on the way to the farm. Pellets with poor physical quality will break apart or abrade during transport and generate dust or fines. So Pellets with good physical quality are hard and durable.

Durability describes the pellet's ability to remain intact during transport and not produce fines. You can measure it by blowing 100 grams of pellets in a pneumatic tester for 30-60 seconds and then calculate the percentage of intact pellets that remain. Another method is to place 500 grams of pellets in a rotating chamber and tumble them for 10 minutes, then measure the percentage of remaining pellets.

Hardness describes the pellet's ability to withstand a crushing force.

WHAT FACTORS AFFECT THE PHYSICAL QUALITY OF PELLETS?

- The **ingredients** that go into the mixture are a primary factor. At least some of them must act as glue to bind the particles together.
- The **grind** of the ingredients is also important; they must be able to close-pack with no internal voids.
- **Conditioning** the mixture with steam provides heat and moisture, which softens the particles and activates natural binders.
- **Compression** of the feed as it passes through the die is critical.
- Finally, **cooling** the pellet and **reducing the moisture** sets the bonds and strengthens the pellets.

WHY ARE PELLETING AIDS USED?

You should choose ingredients that meet your nutritional and economic criteria. Some ingredients may lack binding properties. Others can even be negative. One example is fat, which is very harmful to pellet durability. Ingredients may also be difficult to press through the die and cause blockage. A small amount of **pelleting aid** can often correct these problems.

Pelleting aids can be useful when manufacturing conditions are less than perfect, which is most of the time. In some cases, their use is critical. There are a variety of needs, and

a corresponding variety of pelleting aid options. A well-considered choice and a documented outcome can make a real difference.

WHAT RESULTS CAN YOU EXPECT FROM USING PELLETING AIDS?

Binders should reduce the amount of fines by 25–50%. If a binder is added to a feed that has a pellet durability of 90.0, that durability should increase to 92.5–95.0. If the starting pellet durability is 80.0, it should increase to 85.0–90.0. The lower the initial pellet durability, the larger the improvement will be. However, the percentage of fines reduction, off the pellet tester or at the farm, should be in the range of 25-50%.

Lubricants and scrubbers should reduce amperage by at least 20%, or increase production rate by 25%. In some cases, it may be possible to double the production rate, but that can also reduce physical pellet quality.

Lubricants and scrubbers should reduce amperage by at least 20%, or increase production rate by 25%.

WHAT ARE THE COSTS AND BENEFITS OF USING A PELLETING AID?

Some pellet manufacturers try to keep pelleting aid costs low by limiting the dosage. At some point, the dosage becomes so low that the pelleting aid is no longer effective, and even the small amount spent is wasted. It is, therefore, important to determine the most cost-effective dosage for a pelleting aid in the system where it is being used.

For example, the most cost-effective dosage for a lignosulfonate/lignin-based product could be 0.5%, which might reduce fines by 40%. If the dosage is increased to 1.0%, fines might be reduced by 55%. This is indeed an improvement, but the cost is doubled and the increase in improvement less than half. However, if that improvement causes a farmer to purchase those pellets, the cost is covered and worth it. Besides gaining sales through excellent quality, other benefits of using a pelleting aid include:

- No need to recover poor quality pellets from the farm
- Reduced recycle of fines
- Ability to make pellets with sub-optimal conditions, e.g., boiler problems, worn die
- Ability to formulate with “opportunity” ingredients without loss of pellet durability
- Increased production rate

HOW DO YOU CHOOSE THE RIGHT PELLETING AID?

First, consider the problem you need to solve. Do you want to improve pellet durability? Do you need your press to produce at a higher rate? Do you need to achieve a certain level of water stability in your pellets? Articulating your need will guide your choice towards a binder, lubricant or water stabilizer.

The next consideration might be available “space”. Do you have a bulk bin to hold the pelleting aid, or is there room in the formulation for inclusion of a high-volume pelleting aid? If not, clay binders may not be appropriate. Available “space” will guide the choice between clay (higher dosage levels), a lignosulfonate / lignin-based product, or polymethylolcarbamide (PMC).

Finally, pick two different pelleting aids and see which is the most cost-effective or otherwise appropriate for your needs.

HOW DO YOU APPLY A PELLETING AID?

All pelleting aids are either powder or liquid. Powders should be added to the mixer at the same time as other mid-level ingredients. Liquids can be added to the mixer or applied at the conditioning chamber. There is much debate which method is the best.