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The holistic approach to avoid losses in the feed mill

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In the past five years the cost of ingredients and many feed additives has risen significantly.

However, many feed companies within the Asia Pacific region still do not maintain tight control on stock inventory, scale tolerances and the volume of recycled fines and rework arising from inefficient production processes and equipment.

This lack of control should be considered unsustainable and the aim of this paper is to highlight some of the common areas where waste and losses occur and what steps can be taken to improve so that feed companies remain competitive.

For the purpose of this paper, we are going to consider a typical feed mill from the region, that receives bag and bulk tip raw materials and ingredients, stores corn in silos before transfer to the feed mill for grinding and blending and has a meal and pelleting line for production of final feeds in either packing silos or bulk silos.

Raw material receiving

In the Asia Pacific region, many companies still rely heavily on bags and less in bulk for the receiving of ingredients. In either case it is common to see numerous trucks lined up either inside or outside the mill waiting to unload.

This creates a number of challenges in terms of maintaining control of trucks and personnel while on site and ensuring the correct quantity and type of product are unloaded.

Manual systems that rely on paperwork are prone to human errors. To counter this, automation systems can be installed that replace the paperwork and ensure the movement of trucks and ingredients to the

correct location for discharge as well as provide for accurate stock inventory and traceability.

Raw material unloading

Control of the unloading of raw materials is important to avoid waste. Waste can occur from a number of errors for both bags and bulk. For bulk intakes, errors can result in expensive losses due to incorrect manual silo selection or failure to recognise a silo is full. This represents both financial loss as well as nutritional loss due to mixing of different ingredients.

Programmable Logic Control Units (PLC) in conjunction with adequate and appropriate instrumentation and software can eliminate this type of error through automatic route control and high level silo indicators to show when silos are full. Technology also provides sophisticated bag counters on the unloading conveyors which provide accurate real time stock inventory.

Bag unloading can be inaccurate in terms of ensuring the correct number of bags are unloaded at the correct point. Technology now provides sophisticated bag counters on the unloading conveyors which are difficult to de-fraud and again provide real-time stock inventory.

Grain silos and drying

Often the quantity of grains discharged into and out of silos is not known accurately due to the lack of a weigh scale hopper or in-flight conveyor weighing systems resulting in inaccurate stock reconciliation when transferred to the mill. The most common causes of loss are either wastage due to poor silo management or losses due to moisture shrinkage.

Silo management to prevent grain dete-

rioration is a subject in itself and is a particular challenge in Asia Pacific region because of the need to take in grains at harvest and store for long periods of time.

It is not uncommon to hear of significant volumes of grains being disposed of because they are unfit for purpose when emptying the silos. The other risk is the deterioration due to mycotoxin/bacterial contamination that often occurs due to long-term storage and which can result in significant nutritional losses.

New in-line microwave moisture sensor technology is being utilised to provide real time information as grains either enter or leave the storage silos and are transferred into the feed mill, thereby providing valuable information to assess the total moisture loss from intake through to the mill storage phase. This will allow the operators to make adjustments based on the real moisture content of the formulated mixture or additional moisture addition, at the mixer or conditioning phase.

Grinding

Losses occur at this process step due to the physical effect of grinding on moisture levels. Automating the control of the grinders is one method to optimise throughput and reduce energy costs as well as reduce the moisture loss associated with excessive grinding.

Batch control

The weigh scale system is often associated with losses due to excessive tolerances and lack of in-flight material control. Clearly these losses are significant when you consider microscale weighers and the value of the products that are being weighed. Modern, appropriately sized, mul-

tiple batch-weigh scales and digital PLC controls should provide an accuracy of 0.5 percent or less.

Hand additions and premix addition

The losses that can occur at this stage are significant because of the impact of putting the wrong additive into the wrong feed type, or the impact of under or over dosing.

The most effective method to reduce the risk of errors is to automate the process using either barcoding or weigh stations or a combination of both. This has the advantage of providing complete traceability which can also limit losses if an error does occur.

Flush batching

In many feed mills there is a requirement to flush or purge the mixer and pelleting lines to avoid carryover of specific materials or feed additives, coccidiostats and medicines.

The method of how the mixer and pellet lines are flushed will impact how much loss is associated with this process. Mixer flushing is usually done using a defined quantity of raw material such as corn, which is then re-routed back to a nominated silo for inclusion into specified feed types. Each flush batch represents cost in terms of mixer time, energy consumption and potential losses associated with the re-circulation system.

Therefore, it is important to optimise the scheduling/production planning to ensure the flush process is only used where there is no alternative. This can be achieved most effectively through PLC control which can prevent cross contamination scheduling and programme the flush batch automatically before a sensitive feed type.

The pelleting lines may also require flushing and this again will impact significantly on production cost.

Some feed mills run the same feed material used for the mixer flush through to bulk or packing silos. This is certainly wasteful because of the time involved and the manpower required to pack or transport the rework back to the raw material silos or intake.

Some feed companies use a specified quantity of the first batch of feed, following the coccidiostat or medicine, and run this through the line and recirculate as rework. Once again this is wasteful not only for the reasons already listed, but because each time you reprocess feed there will be some deterioration in some of the heat sensitive



vitamins as well as the risk of over-gelatinisation of starch leading to poorer nutritional performance.

A more efficient flush procedure is to be able to use the flush batch as final feed. This can be done by either removing the coccidiostat or medicine in the final batch but adding this to the existing feed on the basis that when mixed with the original batches it will only represent a minor dilution. Once again the PLC pelleting control can control the routing of different feed types to each pellet line and ensure a flush is created before the next sensitive feed type.

Pelleting crumbling and conditioning

Of all the process points in the feed mill,

pelleting and conditioning represent one of the most wasteful areas in terms of energy, blockage downtime and reprocessed feeds. The major limiting factors are manual control and poor conditioning.

Automated pelleting can reduce the power consumption by more than 40 percent in some cases as well as improve the productive life of pellet die and rolls and prevent blockage and cleanout times. Automation removes the manual variability that leads to suboptimal steam conditioning and power settings resulting in variable pellet quality, which in turn results in a higher level of returns from the sieves. This is particularly important when producing crumbs because in some feed mills sieve return levels of 30 percent are not uncommon which is extremely wasteful as well as resulting in feed being reprocessed three or four times.

Automated pellet control therefore results in a significantly lower level of returns from the sieves, reduced down time and blockages and efficient scheduling of flush batches.

Batching or post pelleting liquid addition systems

Batching, pelleting or post pelleting liquid application systems require very a specific set up, nozzle type and accurate dosing due to the high cost of either over or under-application. Lack of automation control linked to the central batching system frequently leads to variable analysis or performance and variable pellet quality leading to further rework and waste.

Cooling

There are two losses associated with the cooling process. One is the dust and fines that can be lost from the air ducting due to incorrect set up and fan speeds, and the second are the losses associated with moisture loss.

New technology to reduce moisture loss during the cooling process is now available to the industry. This technology is specifically developed to provide vital information to a PLC in order to perform real-time control of a number of parameters that influence moisture loss.

Sieving

Poor pellet quality leads to an increase in fines and dust for rework which incurs losses. The 'throughs' of the sieves, at all settings, should wherever possible be routed back to the pelleting process for immediate reprocessing without the need for any intermediate storage or manual handling.

Mills that have particularly long conveyor or elevator handling systems, or fall from the highest point (usually distributor head) also result in greater damage to pellets (or segregation of coarse and fine material in mash feeds) and hence dust. Sieves can be programmed to switch off when producing medicated feeds to avoid recirculation of medicated dust back to the pellet silos.

Bulk finished feed storage and packing

Errors arising from placing the wrong product



in the wrong silo or placing the product in a silo which is not empty can be avoided by implementing automated route control, fixed silos and high/low level indicators to provide accurate record of how much feed is in each silo.

The other challenge is accurate data about the number of bags packed and sent to the warehouse. Weighing systems and bag counting technology can provide the necessary solution so that management personnel are able to log the productivity of each packing line.

Bulk truck loading

The control of trucks entering the mill and loading procedure can be automated to avoid human errors and provide real time stock inventory and traceability. Modern bar coding technology or computer input screens can remove the element of human errors and avoid having drivers operate the loading system.

Bag loading

In Asia Pacific this represents a real challenge because of the confusion that can occur from having multi loading belts and different products to load. The primary concern is inventory control to ensure the correct product type and quantity has been loaded. This can be most achieved by utilising scanning and bag counting technology.

Plant maintenance

How many feed mills measure the amount of waste each month? An effective automated preventative plant maintenance plan can significantly impact the level of waste from leaks and blockages.

Summary

A lack of adequate waste control should be considered unsustainable if feed companies wish to remain competitive. Losses through moisture loss, inadequate waste control, accuracy of production or time management are not acceptable. Technology is available that can improve all of these factors and also provide valuable real-time stock control from intake to loading and full traceability from supplier to farm.

Agentis Innovations is a specialist in providing and developing technologies that automate manufacturing processes and integrate data collection for the global agricultural industry which include animal feed, aquafeed, pet food, and premixes.

MORE INFORMATION:

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