



## Highlights 10 years of Feed Tech

# Off-the-shelf output transforms into tailor-made production



Large storage capacity is required in remote areas.

*Three major developments can be distinguished when discussing developments in animal feed manufacturing during the past decade: innovation and cost control, consumers playing a leading role and safety beyond all doubt. In this article, especially written for the 10 year anniversary of Feed Tech, Harm Klein of Tebodin CCE elaborates on these events and how they have affected compound feed manufacturing.*

**By Harm Klein, Tebodin CCE, Consultants and Engineers, Deventer, the Netherlands**

In Europe, the years of focusing specifically on turnover increase and 'off-the-shelf' production of large volumes are behind us. Attention has been diverted to, amongst others, food and feed safety and efficiency. Today, engineers in the feed industry find their challenges in developing innovative solutions to serve the changing market. Thinking in terms of cost reduction and market oriented developments of new ideas form a major commercial issue. However, finding solutions regarding the safety aspects, whether these are related to food safety or protection of humans and nature, remain essential.

Governments have come with far more stringent measures and guidelines, which has had a major impact on the production of animal feed. Processes in the feed mill have become more transparent. Because requirements on new installations towards cross contamination and inspections are far more

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**Prices for transport of raw materials by road or rail have come down, which takes away the necessity to build new mills along large waterways.**

rigorous than in the past, the chances of unforeseen problems have been decreased to a minimum.

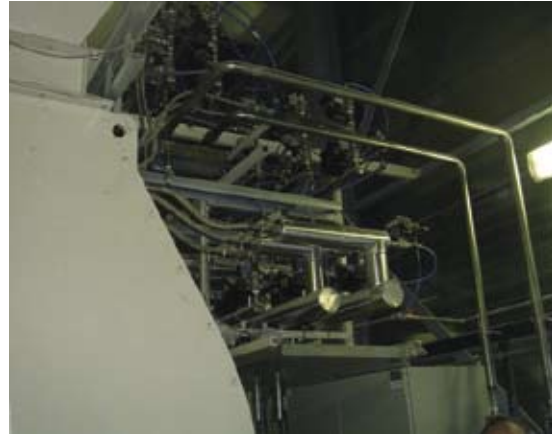
## Comparison with food industry

The control system, but also the instruments on and inside the processing equipment, makes it possible to manage the process to its optimum, to notice deviations immediately and to take the appropriate measures. Current systems within the feed industry are often equal to or sometimes even more sophisticated than those used in the food industry. One of the reasons is that in feed manufacturing a large number of products are used and produced with a minimum number of operators. Materials such as stainless steel – despite the steep price rises – are also more in use, as well as effective coatings to avoid corrosion of materials and adhesion of products to container walls. Furthermore, in the food and feed industry (partly) similar quality control programmes are used. The Dutch GMP+ system for feed, for example, is based on standards from the food industry.

## Reception of raw materials

In the past decades, new feed mills were built next to large waterways, which was beneficial to lowering the cost of transport of the raw materials. The differences in freight costs between ship and truck transport, however, have become smaller in the last couple of years. The choice to build along waterways is now not so logical. Quality control of smaller lots is also easier to conduct. If the mill is located next to a waterway, large silos are often built to store the raw materials.

Effective and dust-free operated intake pits for trucks with a large conveying capacity are sufficient for a reliable intake of raw materials. Newly developed sampling systems reduce the chances in making mistakes and also minimises labour costs. Identification of raw materials with, amongst others,



**The use of stainless steel piping in the feed mill has become more popular due to the use of a larger number of corrosive liquids.**

barcode systems, fit perfectly in a proper quality control system.

## The grinding process

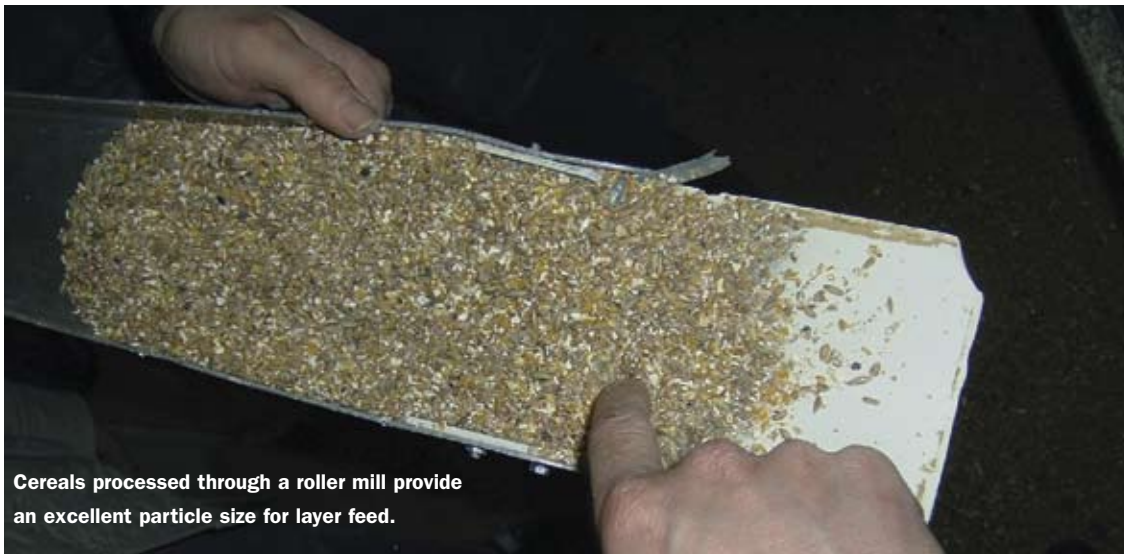
Pricing systems of raw materials in Europe and higher demands in terms of animal feed qualities have assumed more grains into the feed, which require important adaptations of the grinding process. The well-known roller mill has been refurbished and re-introduced for grinding layer feed and to a lesser extent, for making broiler and pig feed. The roller mill is well known in flour mills, however, relatively new in the grinding process of single or mixed materials in the feed industry. This mill (in combination with a hammer mill or not) has led to significant advantages. A roller mill can produce a predictable structure of the mash, retains the fibre structure of the grains and has considerably lower energy consumption. Furthermore, the roller mill is not only used for cereals, but also for pelleted raw materials.

If, instead of a roller mill, a hammer mill is equipped with frequency control, advantages will only be partially met. The vertical hammer mill has been installed regularly in situations where this grinder is suitable.

## The mixing process

The large number of raw materials, recipes and micro-ingredients combined with the desire for more batches per hour and better mixing accuracy, has placed a high demand on the mixing process. To achieve this, the paddle mixer has taken over from the well-known ribbon mixer. A paddle mixer has shorter mixing times, can handle relatively small batches and is better equipped for adding liquids to the mash (and not on the ribbons as in a ribbon mixer).

The mixing process determines, to a high degree, the capacity of the whole manufacturing process and



Cereals processed through a roller mill provide an excellent particle size for layer feed.

the quality of the final product. The influencing factors on the mixing process are numerous:

- Dosing capacity of dosing equipment
- Volume of manually added products
- Specific weight of ingredients
- Spread of particle size
- Flowing capacities of ingredients
- Filling percentage of the mixer
- Mixing speed
- Mixing time

The introduction of the paddle mixer, which is reasonably priced, provided many advantages to the feed industry. The ban on the use of antibiotics has increased the number of liquids that are spread on the mash, which can be efficiently added into a paddle mixer.

### Pre-compacting of products

During the last few years, it appeared that pre-compacting mash with expanders and BOA compactors have great advantages. These conditioners are very useful for high-energy raw materials and significantly increase the capacity of the pelleting line. In view of hygiene, the contribution of these machines is limited; factors such as retention time and first in - first out cannot be warranted. A hygieniser – available in different sizes – is much better equipped to guarantee dwell time and temperature. Besides, the installed power is much lower, whereas the effect on production capacity increase is limited.

Another development is the Universal Pellet Cooker, which is used in several places to produce pig and cattle feed. Conditioning, mixing, gelatinisation and shaping with this machine takes place without the use of a pellet press.

### Trend towards larger mills

There is currently a trend toward the use of larger

pellet mills. Today's pellet mills can have an installed power of 450 kW, providing a capacity of up to 50 tonnes per hour at Ø4 mm poultry pellets. Following this development came the sizes of the required conditioning equipment prior to the pellet mill and cooling equipment after the pellet mill. Pellet mill transmissions have been developed accordingly and the new technology results into lower maintenance cost per tonne of feed produced.

To make the pellet mills easier to handle, a number of developments have taken place:

- Automatic roller adjust to allow roller setting without opening the pellet chamber
- Automatic knife adjustment to control the pellet length
- Pneumatic die and roller hoist for easier die and roller handling
- Special die clamp designs for easier die change

New stainless steel materials are being applied to resist the corrosive feed elements in modern feed industries. Pellet mill hygiene has been significantly improved by smoother designs, which prevents accumulation of material and allow easier cleaning. The installation of active heating elements to pellet mill doors is obvious in this matter. Measuring tools have been developed to test actual feed distribution over the die track during production. This leads to higher pelleting output and longer die and roller service life.

Furthermore, the counter-flow cooler with between-deck is able to facilitate a quick change of recipes in the pelleting line. Also, batch-wise weighing of pellets with a further developed (heated) fat coater led to a more effective and cleaner coating process. The vacuum coater has already been introduced in the making of broiler feed and will probably be used more often with other feeds in the future.

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## Storage and load-out

In recent years, much has been invested in storage and load-out, reasons being: demand for more different types of feed, faster load-out, flexibility, medical mixtures, marketing aspects etc. Using an efficient system pays back quickly. Regarding hygiene matters, belt conveyors have been replaced with movable weighers with pellet sieves and sometimes automatic guided vehicles. Contra-sets are still popular; however, purchase of extra trailers to be filled during night shift is relatively limited.

Bulk blending is still an interesting solution to lower pressure on production with less contamination, protection of heat sensitive components and mixing of pellets with whole grains in poultry feed. The system is regularly applied for medical mixtures with other advantages.

## Safety appliances

The structure of buildings, steel constructions and silos has changed considerably because of regulatory changes concerning environment, safety and ATEX (dust explosion prevention) guidelines. Some of these aspects are: use of heat resistant materials, fire resistant dividing walls, splitting into compartments and noise protection. Regarding dust explosion prevention, compartments are installed with explosion panels, silo decks with lightweight or hinged panels, thicker silo walls and prevention of objects scattering after an accident has taken place.

To increase hygiene standards, smooth surfaces are in use instead of corrugated sheets. Hoppers are made with round edges and often silos too. Stainless steel and special smooth coatings prevent sticking of the product to silo and hopper walls.

## Automation is the key

Feed mills have been automated to a very high degree for many decades. Pressure on production costs has forced the industry toward low labour input and a high degree of automation. The type of process is quite suitable for remote and automatic control. In recent years, the fully automatic control of any feed mill (from intake up to load out) became standard. Manual or semi-automatic operation is now obsolete.

Besides this process control level, functions at a higher level also have been automated. Strong and comprehensive database functions allow operators and management to supervise, optimise and manage the feed mill with maximum efficiency and optimal flexibility.

In feed mill automation an integrated approach has been the benchmark for many years. Powerful interfaces between business computing, process control, formula optimisation, order processing,



**Modern feed mills require high capacity throughput and a compact design. (Photos and illustrations provided by Tebodin CCE)**

Quality management systems and planning tools are in place in most feed mills.

Major developments in logistics and feed safety also have their effect on feed mill automation. Automated checks on cross contamination, tracking & tracing, sophisticated production and distribution planning and advanced control of new and complex machinery cover the needs of a now safe and efficient production. Feed mill control systems need to be absolutely reliable, since 24h production nowadays often becomes the case.

Software is based on proven standard software more than dedicated and tailored supplier-oriented solutions, which used to be in favour in the past. Powerful tools for production planning and scheduling, as well as planning for truck loading and transports, became available for the sector in recent years. Process-linked I/O systems and intelligent field instrumentation are today decentralised and connected through field bus networking to the control system.

## Environment license

In relation to energy saving, waste management, (fine) dust, smell and noise emissions, soil protection, safe operation, insurance criteria etc., strong rules have been introduced during the last decade. The design of the feed mill has to meet these rules, which is why typical solutions have to be found. For the mill's management these matters are not core business and so specialists have been involved for an efficient answer on these complicated regulations.

## In conclusion

Although not always directly visible in the design and execution of the feed manufacturing processes, remarkable changes have been achieved in the past ten years by engineers and suppliers of equipment. The urge for innovation played an important role, but also the necessary interaction between legislation and opportunities within the feed making process. It is often a challenge to follow stricter legislative rules and at the same time keep the advantages of the chosen process. This trend will no doubt continue. Players in the market who are able to anticipate to changes most quickly will have the best chances in staying successful. ●