

## A GUIDE TO

# MANAGING FEED PRODUCTION IN THE SUMMERTIME TO AVOID HEATING AND SPOILAGE

MAY 2021

Whilst demand for feed tapers during the summer, Ireland's prevailing warm, humid weather can mean the challenge of ensuring feed is kept safe increases substantially. The result of feed heating and spoiling over these months can cause major problems for feed millers resulting in financial loss and reputational damage. Overcoming these challenges and mitigating the cost of spoilage can be achieved by understanding the root causes of spoilage, accurately

monitoring raw materials and process conditions and following some simple procedures. In this article, we identify the most common causes of problems, and offer you some simple rules to ensure stable, safe, high quality feeds across these challenging months. This information is relevant to all involved in the feed chain including the buyer, nutritionist, finance, production, quality control, transport and includes handy tips for Sales Reps and customers to help them play their part.

THE ARTICLE IS SPLIT INTO TWO DISTINCT SECTIONS:

1. The role of feed mill personnel
2. The role of Sales Reps and the customer

## SECTION 1: ROLE OF FEED MILL PERSONNEL

In the first section the information is intended for all involved within the feed mill. This will allow everybody to understand how their role can positively influence the process of producing safe feed.

### SUMMER WEATHER PRESENTS UNIQUE CHALLENGES

Heating and spoiling issues in feed are associated with naturally occurring organisms such as insects, mites, moulds, bacteria, and yeasts in the feed. In general, these organisms favour higher ambient air temperatures, high Relative humidity (RH) and high moisture content in raw materials – the typical

environmental conditions of the Irish summer. These organisms do not reproduce/grow very well below air temperature of **14°C and 14% moisture** content. The rate at which reproduction/growth happens in the finished feed will also depend on the initial contamination of the feed materials used.

#### SOME TIPS TO HELP:



**Promote good farming practices where possible:**  
on-farm controls where crops are grown



**Cleaning/sanitising of stores between cargoes/harvest:**  
manage in-house storage



**Disposal of rubbish/dust materials:**  
have a procedure included in your quality system



**Sanitising of problem raw materials:**  
react and remedy (Adesco laboratory support available)

### MONITOR FEED MATERIAL QUALITY

There will be natural variances in moisture, temperature, and quality of feed raw materials. Variances need to be established through measurement (Adesco laboratory support available) and information used to understand and manage the condition of the different feed materials being processed.

### MANAGE MOISTURE AND HUMIDITY IN STORAGE

Environmental conditions/factors required to minimise mould growth in feeds:

- Moisture content: <14%
- Relative humidity: <70%, it cannot be adjusted, so monitor and react as required
- Water activity ( $a_w$ ): <0.75
- Storage temperature: <14°C where possible

It is the relationship between these factors that is important e.g. if storage temperature is high then moisture content needs to be lower or additional protection added (optimal balance).

### KNOW YOUR “PROBLEM” RAW MATERIALS

Some raw materials are more of a cause for concern than others as they may not meet the environmental conditions mentioned earlier:

- Cereal grains which have not been dried to below 14% moisture or treated (properly) with a suitable preservative after harvest.
- Those whose moisture has been increased in shipping or storage.
- By-product materials which have not been properly dried: pollard, distillers.
- Materials coming from very warm countries: these may “sweat” as the air contained in them cools.
- Materials with varying oil contents due to different extraction processes: palm kernel, full fat soya.
- Old materials i.e. greater than 1 year.

Due to changes in climatic patterns, toxic compounds such as deoxynivalenol, ergot alkaloids, aflatoxins and fumonisins are now appearing in cereals (maize) in areas and locations that had not been seen before.

## MANAGING FEED PRODUCTION IN SUMMERTIME: SIMPLE STEPS TO MITIGATE RISK

### MEASURE TO MANAGE

Measure moisture and temperature of all raw materials coming in and finished product going out. This is key to minimising the problem. Pay special attention to the problem raw materials (ground maize, pollard, high oil materials).

### MANAGE THE PROCESS

Be aware of how the processes within the mill impact on material's moisture and temperature.

Steps within the production process which can contribute to heating/spoilage:

- Poor control of moisture in feeds – no measurement.
- Grinding and rolling can increase the temperature of materials by 8–15°C.
- Pelleting: lack of proper monitoring/control of steam/excessive rise in meal temperature passing through the die/inadequate cooling.
- Stock control is critical in summertime. Keep feed as fresh as possible.
- Ensure efficient cooling of pellets to within 4–6°C of ambient.

### STAY ON TARGET FOR FINISHED MOISTURE CONTENT

For finished feed pellets ensure moistures are kept below 14% during summertime. For coarse rations containing high moisture raw materials e.g. high moisture rolled barley, it may be difficult to keep the moisture content below 14%.

### USE THE FEED HYGIENE PROGRAMME WHERE NECESSARY

Some of the moisture may migrate to the lower moisture ingredients, particularly in coarse feeds giving **“Free Moisture”** which may lead to an increase in  $a_w$  (**available water**) creating an ideal environment for heating/mould growth. This can be prevented by protecting the overall ration using the Adesco Feed Hygiene Programme inbuilt in SmartMilling technology. This will ensure adequate protection of the feed i.e. optimise the addition of the product MycroMill/MycoCURB ES via the moisture control programme (recommended minimum 1kg/tonne of MycoCURB ES liquid in the finished feed). This will help prevent mould growth and extend shelf life.

### WORK TOGETHER TO OPTIMISE FEED TURNOVER

During the summer months reduce the time feed is in stores or in farmers bins. This can be done through effective communication between customers, sales reps, transport, and production.

### READ YOUR LABEL

Every label states **“Store in a cool dry place”** – open bays with direct sunlight may not be cool places in summers. Bagged feeds should be stored in the coolest place possible.

---

### <sup>1</sup> WATER ACTIVITY AND ERH EXPLAINED

The moisture content of air is determined by its temperature and materials exchange moisture with the air surrounding them. As air temperature rises, it takes up moisture from the material (evaporation) and as it cools, it releases moisture to the material (condensation). This exchange of moisture continues until the moisture condition of the material reaches its Equilibrium Relative humidity (ERH) or Water activity ( $a_w$ ) value. ERH is expressed as a percentage, Water activity as a decimal.

**An ERH of 80% = an  $a_w$  of 0.8**

If the air surrounding materials is changed by venting this natural process does not cause any problem. However, in enclosed spaces like unvented bins, bags, problems can arise due to:

- During daytime the air above the feed in a bin is heated and evaporates moisture from the feed.
- During night-time, when the air is cooled, it condenses on the cold bin sides and on to the feed. This dampened feed with an  $a_w > 0.75$  is an ideal environment for mould growth.
- If the bin is vented so that the air temperature in the bin remains close to the air temperature outside, then the problem is reduced significantly.

## SECTION 2: ROLE OF SALES REPS AND CUSTOMER

In this section the information is intended for all involved in the sale of feed (Sales Reps) and the customers (end-users, farmers).

### ADDRESSING RISKS IN FEED STORAGE

Whilst the volume of feed used may drop during the summer the challenge in ensuring the feed is “Safe and Sound” increases substantially. This article attempts to increase the understanding of the problem (at all levels) and offer some practical hints at avoiding problems in the first place. Understand why feed heats, the steps to minimise the risk, and put in place good practices.

### SUMMER WEATHER PRESENTS UNIQUE CHALLENGES

Heating and spoiling issues in feed are associated with naturally occurring organisms such as insects, mites, moulds, bacteria, and yeasts in the feed. In general, these organisms favour higher ambient air temperatures; high Relative humidity (RH). These organisms do not reproduce/grow very well below air temperature of **14°C and 14% moisture** content. The rate at which reproduction/growth happens in the finished feed will also depend on the initial contamination of the feed materials used.

### WORK TOGETHER TO OPTIMISE FEED TURNOVER

During the summer months reduce the time feed is in stores or in farmers bins by ordering to match consumption so that the delivery will be consumed in 2–3 weeks. This can be done through effective communication between customers, sales reps, transport and production. This will keep feed as fresh as possible.

### IMPACT OF AMBIENT TEMPERATURES ON FEED TEMPERATURE

Feed temperature will generally be above ambient temperature due to the production processes involved – i.e. rolling, grinding, pelleting, cooling (pellets can only be cooled to within 4–6° of ambient), blowing.

In summertime feed may feel warm to the touch but that does not mean it is heating – it just feels warm compared to your hand. For example, pellets manufactured during the afternoon when ambient temperature was 22°C will be around 26–28°C when loaded and will not lose much heat overnight in the truck. If these pellets are delivered early the following morning – say ambient is 8°C – then they will definitely feel warm to the touch. For this reason, it is essential to measure the temperature of the feed if it is thought to be “heating”.

### FEED BIN STORAGE

Storage temperature in feed bins will increase substantially on warm sunny days. See detailed paragraph on feed bins in the next section.

### FEED STORAGE BAYS

Feed stored in bays/piles will, over time, remain close to the temperature at which it was delivered. Turning the feed at night-time when ambient temperature is lower will reduce the temperature of the feed in the pile.

### READ THE LABEL

Every label states “**Store in a cool dry place**” – open bays with direct sunlight may not be cool places in summers. Bagged feeds should be stored in the coolest place possible.

## KNOW YOUR FEED BINS

Very often the picture inside the bin is very different to what it should be or what the customer thinks it should be! The two most common problems in feed bins are illustrated in the diagram below. In many bins, feed does not empty on a First In-First Out (FIFO) basis. Depending on the design of the bin, feed will empty in a “Funnel Flow” pattern as shown in the left picture below.

This can cause material to build up at the sides especially where the cone meets the straight walls. If a bin is not fully emptied on a regular basis this built-up material will remain in place through successive deliveries because of the “Funnel Flow” effect. So, how do you resolve this?



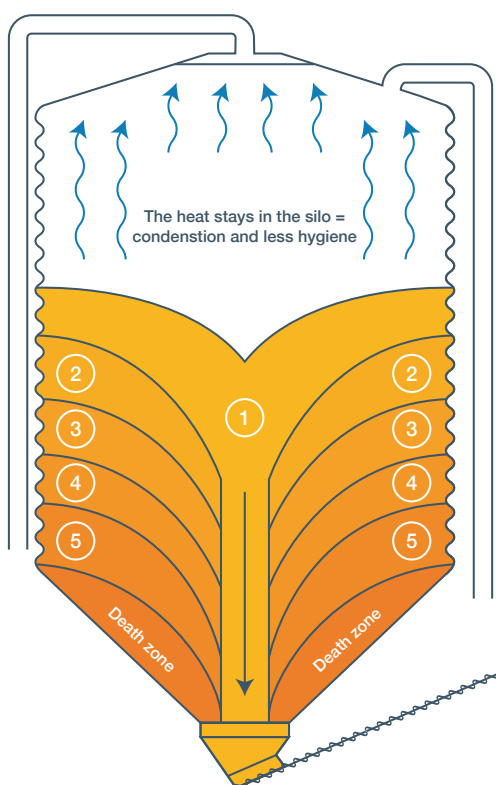
### Useful tip

Ensure the bin hopper angle is at least 60 degrees for meals and 45 for pellets and that the opening is as large as possible. In this regard a rectangular opening is much better than square or round as shown in the right hand picture.

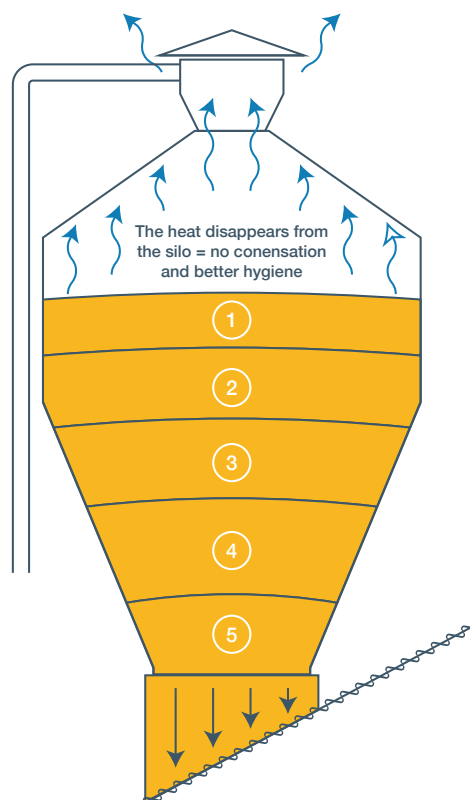


### Did you know?

If the bin is not vented at the very highest point condensation can occur inside the bin causing feed spoilage.



First in, last out.  
Older feed is released the last.



First In-First Out.  
Always fresh feed.

## ADDITIONAL ACTIONS TO HELP REDUCE RISK:

- **Empty regularly**

Try to empty the bin fully each time before the next delivery.

- **Inspection**

Feed bins should be inspected regularly – after every second delivery, especially in the summer.

- **Cleaning/washing**

Depending on their condition feed bins should be power washed at least once per year. (This is a professional job as proper hoists are required for safe working). Allow the bin to dry fully before refilling.