

# Meat sector benefits from significant developments in multihead weighing

The impact and influence that multihead weighing systems have had on all areas of the food industry has been well documented over the years.

Thanks to the superb accuracy of the technology, giveaway, which using other systems could be as much as 15%, has typically been reduced to well under 1%.

Accurate filling has also enabled packs to be designed smaller, reducing the cost of packaging, storage and transport, whilst meeting demands for smaller packs due to decreasing average household sizes in western Europe.

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For food manufacturers, the benefits have been enormous, particularly in terms of the increased productivity that accurate weighing brings. Product that was previously wasted in overfill is now being packed into extra bags or trays. Output has therefore been increased without additional input.

The multihead weighing concept – where individual weigh hoppers weigh product simultaneously and a computer calculates all possible weight combinations and selects the one that comes closest to the target weight – was revolutionary when it was first introduced.

Nevertheless there have been many further equally notable

enhancements and innovations since then which have enabled the multihead weighers to deliver even faster speeds and greater weighing accuracy.

For example, the introduction of stepper motors made a significant contribution to increased speeds. Accuracy levels were enhanced through the use of booster hoppers. These are an additional set of hoppers, located beneath the weigh hoppers.

Product weighed but not selected for the pack is discharged into the booster hoppers, thus freeing up the weigh hoppers to receive more product and further increasing the available weight combinations to boost weighing speed and efficiency.

More recently Digital Signal Processing (DSP) and Anti-Floor Vibration (AFV) features have set new standards for speed and accuracy.

Both technologies recognise that in most instances the weighing of product does not take place under ideal conditions.

For example, vibration such as fork lift trucks, vibrator feeders, bagmakers and even the footsteps of factory workers can lead to inaccurate weight readings and thus reduce speed and accuracy.

AFV senses the level of floor vibration and compensates for it. This is then combined with DSP, so that weigh heads that remain unused for one weighing cycle have their signals significantly filtered, while those that have just been



**A linear layout and the use of rotating corkscrews to move product are two examples of how multihead weighing technology is able to handle fresh meat.**



used benefit from the application of AFV. The result in both cases is more accurate weighing.

AFV and DSP technologies have continued to be enhanced and have been joined by Pulse Width Modulation (PWM) technology, an electronic drive system which helps to maintain a consistent product flow to the pool hoppers.

Multihead weighers have also helped companies meet demand to deliver sustainability in all areas of their business.

Accurate weighing leads to smaller packaging which in turn minimises material consumption and reduces transport costs, while modern weighers are highly energy efficient.

## Application features

Another important development for multihead weighing – and one which has had particular significance for the meat industry – has been the introduction of application-specific features that can deal with products with special handling characteristics. This has enabled processors to respond to the growth in popularity of value added pre-packed fresh meat and poultry.

One of the challenges of handling fresh meat in any type of auto-

mated system is its sticky nature which makes it difficult for the product to flow freely.

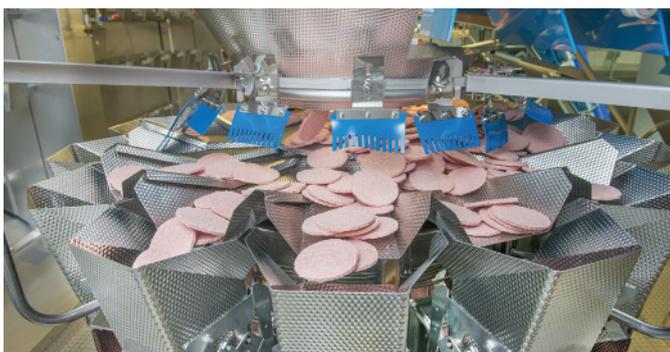
This has been met through a variety of innovative solutions, with features including anti-stick contact surfaces, specially adapted dispersion feeder tables, using rotating screws instead of radial feeders, plastic hoppers with scraper gates and belt feeders that keep product moving easily. These have now been combined with designs specifically created for meat and poultry applications.

One example retains the combination weighing principle, but incorporates it in a linear layout where an operator feeds product to a set of belt feeders, who in turn deliver the product to plastic or metal scraper (pool) hoppers.

The belt feeders act not only as a feed buffer but they also cope easily with the most sticky products such as marinated meat or poultry, ensuring a consistent product delivery to the pool and weigh hoppers, which then operate in the same way as the circular multihead models.

The Ishida Fresh Food Weigher (FFW) can now handle the output of up to five operators and together with its higher accuracy and consistency – with product giveaway typically less than 1% of the target weight – payback periods for this

## Accurate weighing brings improved productivity.



machine have been shown to be as low as just six months.

Another bespoke design for meat products retains the more familiar circular multihead weigher layout but incorporates unique rotating stainless steel screws to replace the traditionally used radial feed troughs. The use of these screws provides a powerful, controlled and fully automatic product feed to the hoppers.

This technology is able to double packing speeds for the stickiest products, while again using the combination weighing principle to significantly reduce giveaway.

Of course, when it comes to convenience products, fast and accurate weighing is only half the battle.

Attractive presentation is also essential for retail markets. The automatic weighing of the product can therefore be combined with a manual batching operation to ensure that the meat or poultry in each tray is appropriately placed and styled in each tray.

For example, the screw feeder weigher can be combined with a linear or rotary batching table containing individual stations, where operators receive an accurately weighed portion, transfer it to a tray, style it and then place the tray onto a belt which takes it for sealing, labelling and quality control.

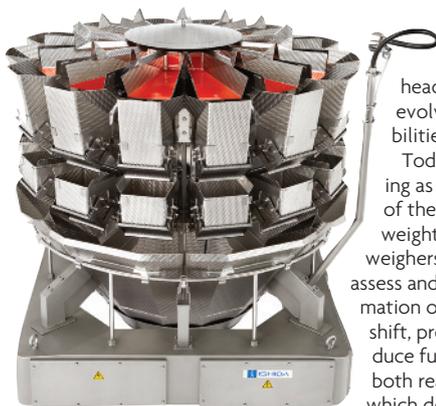
The station automatically informs the system once the filled and styled tray has left, triggering the sending of another weighed portion to be packed.

A typical system featuring eight operators, can deliver speeds of 55 trays per minute with an average giveaway of only 1% of the target weight.

### Grading by weight

Multihead weighing technology is also used to grade meat and poultry cutups by piece weight, count or minimum weight. The central idea

### The latest weighers incorporate features such as AFV and DSP, which have set new standards for speed and accuracy.



**Weighers can be combined with a batching operation for effective styling and presentation in trays and accuracy.**

of using a multihead weigher for grading is to use many weigh heads to individually classify incoming pieces of cutups and, depending on exact piece weights, to release them into either the graded product stream or into one or more 'out of spec' streams which can then be put to other, non-premium uses.

How it works is that a rotating infeed chute distributes successive (poultry) cutups (such as wings or thighs) into a set of pool hoppers.

These pool hoppers feed a set of weigh hoppers, which can release their contents in either of two different directions depending on whether their piece weight is appropriate to go into the graded product stream or into the bulk stream for further processing.

The multihead grader grades with great accuracy (with an error of just  $\pm 0.1g$ ) and can easily handle the 240 pieces per minute needed to keep pace with the cut-up machinery. In tests under typical industry conditions and without intensive training it has consistently demonstrated efficiency levels of 90-98%.

Given the immense versatility of multihead weighers and their ability to deliver effective quality control in terms of both pack weight and product consistency, the checkweigher might at first glance be considered as somewhat redundant.

However, just as multihead weighing technology has evolved, so too have the capabilities of checkweighers.

Today, instead of merely acting as the 'policeman' at the end of the line to ensure pack weights are correct, checkweighers are able to monitor, assess and provide detailed information on weight data by batch, shift, product or machine to produce fully customised reports – both real time and historical – which depict such crucial param-

eters as downtime, OEE (Overall Equipment Efficiency) of the production line, and product giveaway.

These reports are fully customised to meet an individual manufacturer's needs and can be instrumental in identifying cost saving opportunities, minimising product giveaway and improving production efficiencies.

In addition, specialist software is now available that enables such information to be gathered from up to 100 individual checkweighers and compiled into a single secure database, so that the overall performance of the factory can be assessed.

The information can also be accessed remotely, allowing production managers to monitor their operations from anywhere in the world from a laptop or mobile phone.

### Central control

All these developments in weighing technology are significant in their own right but they have also been taking place against a background of increased integration with the ability of all equipment on the production and packing line to interface

### Checkweighers are able to monitor, assess and provide detailed information for enhanced OEE.



with each other to provide a complete single system.

As a result, we are seeing the increasing use of project management in the development of packing lines.

Instead of sourcing individual pieces of equipment from different companies, meat and poultry processors are using one supplier to devise and install the entire line, linking together all the different machines into one centrally controlled operation in order to ensure that throughput is maximised and all parts of the line are working to the greatest efficiency.

Having one supplier take full responsibility in this way means customers also benefit from a single point of contact.

At the same time, many suppliers are also extending their product ranges to include all the major elements of the packing line from weighers and tray sealers to inspection systems and end of line packing.

### Conclusion

Multihead weighing technology caused a revolution on its first introduction to the food sector and it has continued to make an impact since then.

For the meat sector it has delivered levels of automation that only a few years ago were not thought possible and it has allowed the industry to take full advantage of consumer demand for convenience packs.

Given what has already been achieved, it is safe to say that there may yet be more significant developments to come in the future. ■