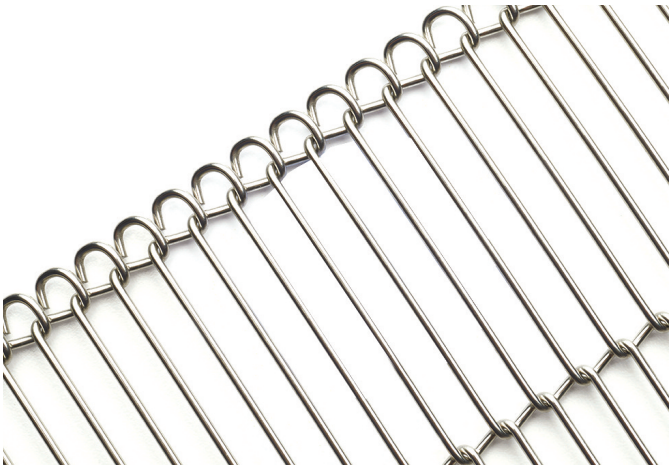
Effective utilisation of food technologies

SUPPLEMENT

International Food Hygiene

Hygienic stainless steel belting



Wire Belt Company Ltd, Castle Road, Eurolink Industrial Centre, Sittingbourne, Kent, UK.

The use of stainless steel Flat-Flex and Compact Grid belting instead of modular plastic types can increase food conveyor hygiene standards by at least 10 times, and in some cases by more than 100 times.

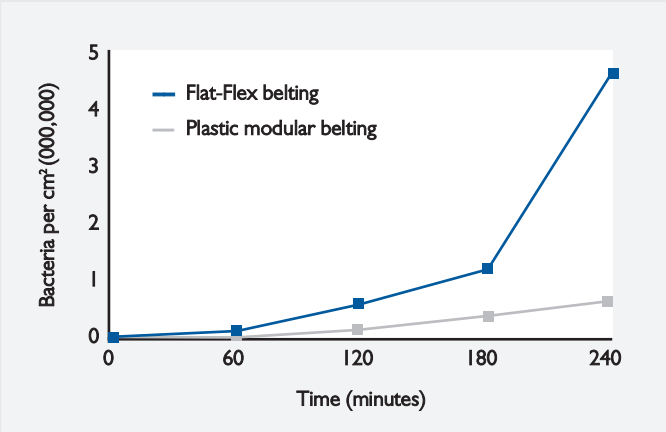
Research in the UK and USA shows that, under production conditions, Wire Belt's Flat-Flex belting is more hygienic than plastic types for conveying vegetables, meat and fish. This shows that stainless steel is preferable to plastic where hygiene and ease of sanitation are important, especially in areas where accessibility and extended production runs present cleaning problems.

The openness of the Flat-Flex results in less build-up of contaminants than plastic modular belts, as well as making cleaning easier and allowing visual inspection of drive shafts without the need for dismantling. The advantages of stainless steel over plastic for belting include easier and more effective cleaning as well as greater resistance to damage resulting in scratches and crevices that can lead to increased opportunities for attachment and growth of bacteria.

Lower contamination level

Research in the UK shows that with fish and meat Flat-Flex picks up fewer bacteria, maintains a lower level of contamination over time and is easier to sanitise, possibly because the gaps in plastic modular belting cannot be as readily cleaned as the stainless steel belting and harbour bacteria with quicker recontamination of the belt as a consequence. Drive shafts and the undersides of plastic modular belting are particularly difficult to clean in comparison with Flat-Flex belting. Experiments with meat and fish also showed that plastic modular belting tended to contain trapped debris, even after thorough sanitising and rinsing.

Fig. 1. Plastic modular and Flat-Flex belting sanitised with Multikleen and exposed to chicken meat.



Experiments with carrots showed that Flat-Flex could usually be cleaned to a satisfactory level with just one clean, but plastic modular belting often required a second or even third clean to reach a standard acceptable for production to start.

The increasingly rapid growth in bacteria on plastic modular belting compared with Flat-Flex stainless steel belting, especially after two hours, is shown by results of the study with chicken meat (Fig. 1) after sanitisation with Multikleen.

Reduce the formation of biofilms

In the USA, where Flat-Flex is approved by the US Department of Agriculture (USDA), research shows that, with proper cleaning and sanitising schedules, stainless steel belting reduces the problems of biofilms forming on product contact and non-contact surfaces. Consisting of microbes and substances that protect them from surrounding environments, biofilms can harbour potentially dangerous pathogens and create reservoirs of contaminants that are very difficult to eradicate completely.

Once a biofilm is established, bacteria living within it can withstand stronger doses of sanitising agent – up to 3000 times stronger than unattached cells – and are more resistant to heat. Bacteria can also be loosened and contaminate product flowing over the biofilms.

Design features of Flat-Flex and Compact Grid help to eliminate the crevices and hard-to-reach places where biofilms form, and also help to improve hygiene levels generally, especially in high-usage and difficult-to-clean areas of conveyor belting. They have between 70-85% open framework structure, are designed to reduce or eliminate areas where product or debris can become lodged and do not typically need to be removed from the conveyor system for cleaning.

Current trends

As a belt manufacturer Wire Belt have identified a trend for Original Equipment Manufacturers to increase the working width of their equipment. The aim is to get the greatest available throughput from a single production line. Developments in processing machinery have removed many of the traditional 'bottlenecks' in a production line, and manufacturers are now taking advantage of the greater widths available to increase productivity.

Production lines are also becoming more modular to give greater flexibility in product ranges, and also to reduce time spent in wash-down between production runs. Sliding rail systems allow side-by-side conveyors to divert product from separate infeed lines into common cooking/chilling/packing lines, and we have seen the introduction of removable sumps for quick changeover of coating applications. ■

www.wirebelt.co.uk

Food safety first is the order of the day

Marijke Bellemans, Tomra, Belgium.

Data revealing aflatoxins to be the biggest cause of food-related recalls demonstrates the important role effective sorting and quality analysis systems can play in boosting food safety on the production line. The first quarter European Recall & Notification Index, produced by Stericycle Expert Solutions, found that aflatoxins – a fungal toxin that contaminates crops – were behind 21% of all food recalls, followed by salmonella, pesticides/ fungicides, metal fragments, chemicals, listeria, insects and E. coli.

Despite an overall drop in food recalls on last quarter of 2014, there was a 67% increase in recalls relating to nuts, largely as a result of issues with products coming from India and China. Those originating in China spread to 13 countries and were primarily due to aflatoxins. Implementing sorting technology can significantly reduce the risk of contamination from aflatoxins, mycotoxins and foreign material, driving up food safety on the production line and offering a smart investment for processors and manufacturers.

Protection through performance

Delivering high quality, safe food is good for business. The reputational and financial impact of a product recall can be devastating for a company. Effective food sorting and analysis equipment have a huge role to play in consumer and brand protection so implementing these processes makes good business sense – good food safety performance protects consumers, which in turn protects the corporate brand.

The data from Stericycle Expert Solutions demonstrates the challenge faced by food processors operating within a global supply chain. The food industry is growing significantly and facing productivity, economic, efficiency and environmental pressures more than ever before. Increasing demand on the world's food resources has made today's food supply complex and multifaceted and whilst a global supply chain brings many benefits it also presents a major food safety headache.

The longer and more complicated the chain, the higher the risk of contamination and spoilage. In addition, increasing exports and imports mean food processors and manufacturers have to comply with numerous cross-border regulations. In some cases, imports are from countries where safety standards are lower than in the EU or US, making it all the more necessary to ensure food sorting and analysis systems operate in line with emerging food safety issues.

Prevention is better than cure

The implementation of the Food Safety Modernization Act (FSMA) in the US is food for thought for nations around the world. Taking a 'prevention is better than the cure' approach, the act makes food safety the responsibility of all links between field and fork and encourages a coordinated domestic and international strategy. Whilst the idea of prevention is not new, it is now recognised that for all the strengths of the US food supply chain, a breakdown between farm and fork can have a disastrous impact and cause significant economic loss to the food industry.

Tomra Sorting Food is a leading provider of food sorting machines and processing technology for the fresh and processed food industries. The company's focus on research and development has enabled it to develop a range of innovative sorting machines which are able to detect and remove the smallest of defects and foreign material from production lines.

Tomra machines use a variety of sensors which go far beyond the common use of colour cameras. Near Infra-Red (NIR) spectroscopy enables an analysis of the molecular structure of a product, whilst X-rays, fluorescent lighting and lasers measure the elemental composition of objects. The internal composition and surface structure of objects can also be analysed to determine good or bad produce.

Far-reaching benefits

The benefits of sorting technology are far-reaching. Beyond food safety and brand protection, it enables processors to deliver consistently high quality products to their customers, maximising yield and profit, whilst reducing food waste – a great concern for the supply chain as the world's population continues to grow. As safety regulations and the demand for food have increased, optical and sensor-based sorting has become a requisite rather than a luxury for many producers who have previously relied upon manual sorting and inspection. Furthermore, processors are also increasing the number and variety of sorting and analysis machines on their lines to ensure they are eliminating poor quality product and foreign material as much as possible.

With millions of individual product items passing through every hour, robust systems which can detect and remove the smallest of contaminants are vital in managing food safety on the production line. ■

www.tomra.com

Fast freezing with tunnel freezers

Annette Wille, President Technology Center Freezer, GEA.

Many types of vegetables and berries or French fries require special treatment if they are to be frozen efficiently without loss of quality. For many processors, tunnel freezers have become the technology of choice for these demanding applications. This article looks at how frozen foods are effectively, yet gently frozen in their passage through such a tunnel. Blast freezing is a continuous process that has become essential for large volume, high product yield, high quality, and cost effective operations. Tunnel freezers fall within this category and include, for example, impingement tunnel freezers and IQF tunnel freezers (Individual Quick Freezing). Both impingement and IQF tunnel freezers have particular benefits for processing vegetables and berries or French fries: both work with belts that transport the food through the tunnel.

Impingement freezers

Impingement is the process of directing high-velocity air jets at the top and bottom of a food product. Impingement cold air-jets remove the static surface boundary layer that surrounds the product to enable very fast freezing. If freezing is rapid, a large number of small ice crystals will form within and between cells. By contrast, slow freezing allows the initial crystals to grow creating a smaller number of very large crystals between the cells. These large crystals, and the withdrawal of water from the cells, would break down food structures, resulting in high drip losses and a deterioration in quality.

Impingement freezing is ideally suited to products with a high surface area-to-weight ratio such as hamburger patties, fish fillets and other flat products that can be placed on the belt without direct contact with their neighbours. Impingement technology is also used for crust freezing in which the product's outer surface is quickly frozen to prevent sticking and to minimise dehydration loss. With an effective air-jet system the air pressure drop across the system is minimised and the fans use less power.

IQF tunnel freezers

IQF stands for individual quick freezing. IQF tunnel freezers are used to freeze fruit and vegetables such as peas, cut corn, diced carrots, and strawberries. Bulk products are loaded on a mesh conveyor belt and moved through a freezing zone in which cold air is directed upwards through the mesh belt. Individual Quick Freezing is achieved with the combination of the cold air flow and gentle mechanical fluidisation of the product bed. The IQF process involves two separate treatments as the products successively cross two sections in an IQF tunnel. The first area is a crusting section followed by a finish belt that freezes the product to its core.

The retention time in each of these sections can be adjusted separately. After the crusting section, the product bed depth may often be increased on the finish belt as there is no risk of product clumping. This saves belt length and enables a more compact footprint.

GEA raspberry freezer in operation.

A key element that influences product yield is product handling through the fluidisation process. To prevent surface damage the product must be fluidised gently and not shaken. Advanced fluidisation systems are able to handle extremely sensitive foods such as raspberries. The system has been proven, for example, by Enfield Farms in the USA. In the past the company was unable to preserve raspberries in a way that ensured the quality of the product without using liquid nitrogen for the pre-crusting operation.

"Using liquid nitrogen can get very expensive as we were using about 2-3 tanker loads per day with our old tunnel," explained Andy Enfield, the company's Vice President. "We wanted to eliminate the use of liquid nitrogen and find a way to maintain the high quality of our product, without this huge expense." Enfield Farms now uses a tunnel freezer that eliminates the need for liquid nitrogen pre-crusting before freezing for highly sensitive products such as raspberries. By combining even air distribution, high air pressure, and gentle mechanical product agitation, the freezer ensures true fluidisation. Enfield Farms has also been able to reduce power consumption as the new freezer operates at a suction temperature of -35°C, which offers more than 20% energy savings for the processor compared with the -40°C required by many other freezers.

Freezing French fries

IQF tunnel technology is also used for the freezing of French fries that represents a full process in itself: cooling, refrigerating, and freezing steps in one tunnel. French fries freezing tunnels are able to handle large capacities. A typical 20-t/h French fries tunnel is 55.4m long x 5.8m wide x 5.4m high and requires 3,200kW refrigerating capacity. Energy consumption for companies dealing with these volumes of product is inevitably high.

In a reference plant French fries are processed in a deep-fryer, then pass through a cooling and freezing tunnel that reduces the product temperature from about 95°C to -18°C. The IQF tunnel for French fries will typically have a number of temperature zones.

The initial pre-cooling section has a thermosyphon coil that uses ammonia as the refrigerant. After condensation in an evaporative condenser, the ammonia evaporates in the coil; this generates enough energy to cool the French fries from 95°C to 50°C, without the use of refrigerating compressors. This process is virtually energy-free. The subsequent pre-cooling section includes a heat exchanger fed by water from the plant. During circulation in this coil, water is warmed from 15°C to 22°C while the French fries are cooled from 50°C to 30°C. This saves energy in the factory hot-water system.

The next step is the refrigerated section that decreases the product temperature from 30°C to 10°C. The final freezing section lowers the product to the -18°C outfeed temperature. In addition, the waste heat produced by the refrigerating system in such plants can be used by heat-pump technology to heat water from 30°C to 80°C for use in other parts of the plant – resulting in further energy savings. Developments in freezing and refrigeration technology have come a long way in recent years. The use of tunnel freezers for freezing highly sensitive foods is a major contribution helping processors increase yield, reduce costs, limit energy usage and enhance product quality. ■

www.gea.com

Using X-rays to protect brand reputation

Torsten Giese, Marketing Manager PR & Exhibitions, Ishida Europe.

Today's consumers have high quality standards; retailers have rigorous procedures in place to deliver these; and legislation often demands that food businesses take reasonable steps to avoid any type of product contamination.

Foreign bodies in food products can lead to a variety of outcomes among consumers, everything from mild disapproval to health hazards. The first can sometimes generate a complaint, the second possibly even legal action. In the worst case scenarios, these can have severe financial implications for a company. Even if a contaminated or damaged item is spotted before it reaches the consumer, the cost of a product recall from the retailer, not to mention the likelihood of a retailer fine, can be immense.

Proactive approach to quality control

Underlying all these pitfalls is the damage that they can cause to a company's or brand's reputation – which can take a long while to build up but only a moment to dismantle. Companies are therefore increasingly taking a pro-active approach to quality control, putting in place systems that ensure that any potential quality or safety issues are swiftly identified and dealt with before goods leave the factory.

In this scenario, investing in a suitable X-ray system can be seen to make a lot of sense. X-ray inspection offers huge flexibility and versatility in terms of its inspection capabilities, picking up inconsistencies in materials, in a pack, or in a flow of product passing a given point. It can detect pieces of bone, stone and glass and metals such as iron and stainless steel, as well as dense plastics. The minimum size of particle that can be detected varies from one material to another, depending on the size, density, shape and the type of packaging or product, and the precise capabilities of the X-ray system.

One of the most important factors in X-ray's versatility is that, unlike metal detectors, machines can detect a full range of inconsistencies and foreign bodies in products packed in foil or metallised film. Another benefit of the technology is that X-ray systems can work undeterred in even the harshest of environments, such as humid and wet atmospheres and extreme hot and cold temperatures. However, product quality can be about far more than foreign bodies in packs. Poor presentation, non-uniform product or incomplete packs can be equally damaging to brand reputation.

X-ray systems are capable of detecting many other inconsistencies. The technology can identify voids and broken, undersized or missing items in packs, be that six biscuit bars instead of seven or a number of chocolate bars with one missing; it can spot deformed product, for example a beef burger that has not been formed properly, and deformed packaging such as product in seal. Under-filled compartments in ready meals, product with cracks, grains stuck together in powdered products, and missing metal clips are further examples of imperfections that can also be detected.

In addition, X-ray inspection can perform a number of other functions, such as weight estimation and checking the presence of bottle caps and fill levels. These further widen a company's ability to implement effective quality control. This high level of quality control extends to the ability to offer full traceability. For example, in the event of a complaint, ERP (Enterprise Resource Planning) or other data systems linked to X-ray inspection can enable retrieval of the X-ray image of a particular pack, establishing beyond doubt whether or not it contained a foreign body or showed a quality issue such as a missing item. It is also very useful for false claims as the system can capture every single image.

X-ray works by shining a beam through the item to be inspected. A photodiode array on the other side of the item picks up the radiation that gets through. The photodiodes give out a voltage/signal depending on the level of X-ray that they detect which is then converted into a greyscale image that can be easily saved. If contaminants are present which are denser than the product, these will show up as darker patches, where less X-ray radiation was able to get through. Voids and fissures will show up as lighter, as more radiation is able to penetrate. The system can be set to automatically reject items that have either type of defect.

Choosing the best system

Choosing the best X-ray system will depend on the requirements of each company and its customers, but in terms of consistency of detection the right level of sensitivity is essential. Companies therefore need to set levels (minimum particle sizes) for the foreign bodies that they most need to guard against. At the same time, there is no need to specify a machine with many sophisticated features that add capability that a company will never use. Size is another important consideration. Any system has to deliver an inspection beam that will accommodate the largest products routinely produced on the line. However, unless the need exists to future-proof the production line against larger packs, anything larger will escalate the price for no great return.

Machines that have the ability to vary their kV and mA are able to control the photons passing through the product, providing a clearer difference between the product and the foreign body. Imagine taking a photo with a bright flash – too much light gives over exposure, whereas the correct level of light will give a sharp image. This feature is especially useful when looking for low density items. Even the most basic models often go beyond simple detection, and offer facilities such as product masking (the ability to apply full sensitivity to areas under investigation while 'ignoring' items that form part of the packaging, such as clips and ties).

Since operator time is an important cost factor, it is equally essential that the chosen X-ray system is user-friendly. Companies using their X-ray for traceability also need to ensure it can interface readily with their own data resource systems. Systems that offer fast start-ups and where the sensitivity can be changed while the machine is running help to minimise downtime and increase efficiency. X-ray systems are extremely versatile in terms of their capabilities and the different levels of quality monitoring and inspection that they offer. Tailoring a system to the precise requirements of a company will help protect its reputation and its brand. ■

www.ishidaeurope.com

Exploring hygienic food packaging

Robert van Mol, product manager, and Markus Schlumberger, sales director, Bosch Packaging Technology.

Increasing food safety requirements and consumer awareness towards product contaminants and allergens are driving changes within the packaging industry. In order to decrease cross-contamination risks, manufacturers are re-evaluating their approach towards their product packaging. It is not just the reduction of risk that secure packaging provides. Extended shelf life, especially for highly sensitive products, such as liquid and viscous foods, is an additional and vital benefit for many manufacturers, retailers and consumers. In particular, this is important in warmer climates and when shipping long distances outside of a cooling chain.

The latest packaging machinery advancements are designed to the highest hygiene standards with cleanability, versatility and ease of use being the top priorities. Operators can easily access any product-contact surfaces of the machine, facilitating thorough cleaning and reducing risks attributed to cross contamination. This article looks at the latest filling and packaging developments for sensitive products such as liquid food and baby food, as well as fresh and frozen products.

Increasing hygiene levels

There are varying levels of hygiene available to liquid food manufacturers. Today's technologies allow for the hygienic filling and packaging of food at clean, ultra-clean and aseptic levels. For example, clean processing provides adequate protection and shelf stability for cooking oils and hot-filled fruit juices that are largely germ-free. Other products, such as natural yogurts, cold-filled crushed tomatoes or chilled puddings, require a stricter process called ultra-clean.

Aseptic filling, which is the highest hygiene level, is necessary for products such as dairy and baby food, which need to be shelf-stable outside of the cooling chain. Products low in acid, such as desserts, cold-filled soups, sauces and protein-based drinks, also require aseptic filling. The aseptic process also gives manufacturers an opportunity to extend the product shelf life for up to 12 months outside of the cooling chain without losing quality or adding any preservatives. This is a key selling point for health-conscious consumers, and in many cases, can be eaten directly from the containers – the ultimate in convenience. Extended shelf life also facilitates storing and shipping as no refrigeration is required, which is particularly important for hot climates like Latin America, the Middle East or South-East Asia.

Liquid and viscous food producers can choose from a number of filling and packaging technologies depending on their specific requirements. For example, thermoforming technologies are one of the solutions for effectively forming, filling and sealing such foods. Fast production (up to 178,000 cups per hour) is coupled with optimal nutrition protection and, crucially, extended shelf life for products like yogurts, desserts, coffee creamers, baby food or clinical nutrition products. Cups are thermoformed either from a polypropylene or polystyrene reel, filled with highly precise piston fillers and closed by heat-sealing the top of the lid. The latest technological advancements allow for the production of various cup heights on thermoforming machines. Furthermore, operators do not require tools when changing the cup height, quickly allowing manufacturers to adapt to different market trends; ultimately saving time and money.

For producers in favour of pre-made cups and bottles, clean, ultra-clean and aseptic filling options are available. One of the latest advancements in filling technologies for ultra clean applications includes decontaminating the cup with pulsed light as an alternative to the use of hydrogen peroxide decontamination. Depending on the product requirements, the corresponding decontamination method is chosen to ensure optimised product safety. While hygiene is very much at the forefront of these machines, other essential features include the ability to process fast changeovers of cup diameters, increasing flexibility to address the market and consumer needs. Thanks to the latest developments, such as the Ampack AF format changeable inline cup filling machine from Bosch Packaging Technology, these changeovers are possible in as little as 15 minutes, enhancing flexibility and reducing downtime.

Fresh and frozen foods

While liquid, viscous and baby foods have traditionally been at the cutting edge of high hygiene levels, other food sectors are now closing in. For example, the latest trends in the fresh and frozen food market have been towards intensifying regulations for greater control over product safety. Regulatory bodies, such as the British Retail Consortium (BRC) Global Standards, the main standard in the UK and Scandinavia, but also recognised globally, have recently enacted Version 6 to enhance consumer safety, including an increased emphasis on hygienic packaging.

There are different elements food producers should take into account when selecting packaging equipment for fresh and frozen food in order to address the latest food safety standards. Luckily for food producers, packaging solutions providers, such as Bosch, have developed machines that can not only match, but exceed the increasingly stringent expectations.

An essential first step in the fresh and frozen food production process is to ensure that 100% of the machine's surfaces that come into contact with the products are made from stainless-steel; it is crucial to ensure product safety. Such surfaces also resist corrosion and stand up to the harsh chemicals that are used for cleaning. To decrease the risk of contamination and pollution, machine cables need to be kept short and to a minimum. Holes and slots where food could be caught have to be eliminated. When looking for a packaging solution partner, producers should also check to see if the machines are constructed using FDA-certified materials, with minimal horizontal surfaces, and surfaces with slopes of a few degrees to discharge water.

It is essential that all equipment is self-draining as residual liquids can generate microbial growth and leftover cleaning fluids can result in product contamination. With hygiene becoming increasingly important in the packaging industry, manufacturers need to be assured that the quality of their product does not become compromised. Luckily there are options out there on the market that address both concerns. For example, Bosch's SVC platform of vertical form, fill and seal machines is designed with simplicity, versatility and cleanability in mind, as well as being in line with all of the principles outlined above.

Regardless of the industry – it is critical for manufacturers to reach out to packaging solution providers with the expertise on particular products and applications. This will ensure the selection of the correct solution that will not only satisfy food safety regulations, but also production goals. ■

www.boschpackaging.com

Achieving a uniform mix for powders and liquids

Claus Patscheider, Area Sales Manager – Mixing Systems, GEA.

For all food manufacturers, quality is key. Only by providing foods of consistently high quality can they build markets, keep increasingly discerning customers happy, and protect the vitally important image of globally recognised brands. The ability to mix powders and liquids homogenously is a key requirement.

In this article, GEA looks at the key factors for achieving the uniform mixing of liquid and powder food products to ensure product safety, efficacy and lasting customer appeal.

Powder mixing

Most powders, such as infant and adult formulas, are a combination of major, minor and micro ingredients that must be mixed in a precise ratio, in accordance with the required recipe. As these products are often consumed by the most vulnerable members of our society, ensuring product safety, ease of use and maximum nutritional benefit, is essential.

However, achieving a uniform mix can be difficult. Many micro ingredients, such as pro and pre-biotics, can represent only a small fraction of total product volume yet must be evenly dispersed throughout the product. Minor and micro ingredients often have a different mass and particle size to the major product and so homogeneity can be difficult to achieve and separation can occur during packing and storage. Some products can be dangerous to the consumer if the dose is wrong. It is also essential to achieve this homogeneity quickly, to maximise productivity and avoid damaging the product.

All manufacturers have rigorous quality control testing procedures that will identify if a product has failed to achieve the required uniformity of mix. Should this happen, entire batches can be rejected wasting time, money and valuable product.

According to GEA one of the key factors in achieving a uniform mix is the operation and integrity of the mixer itself. Mixing is the last possible point in the production process at which the customer can guarantee the accuracy of the product recipe and ensure that it meets regulatory guidelines. If the tolerances within the machine are insufficiently tight there will be an increase in 'product hang' where product gets stuck in 'dead' areas of the mixer and not mixed properly. This potentially changes the recipe from that prescribed and can allow insufficiently mixed clumps of product to be discharged into the finished product.

To combat this problem GEA has invested heavily in recent years to ensure the rigidity of its mixers, thereby allowing extremely tight manufacturing tolerances therefore ensuring that the products can be mixed fully. GEA also favours a counter-rotating twin paddle mixing system that mechanically fluidises the different powders as they are introduced, dragging them towards the centre of the mixer to create a light, fluffy, aerated fluid that ensures powders of different densities and particle size are mixed homogenously.

The twin paddle system also ensures fast mixing with product requiring only 60-90 seconds residency time compared with up to 15 minutes for other systems. This is important to reduce the stress on the product itself that can cause the breakdown of the powder's agglomerated particles. If the particles are severely damaged during mixing, the wetting properties of the final product will be adversely affected so it will not dissolve as easily in use.

Damage also affects the bulk density of the product so it coagulates at the bottom of the retail pack creating half-filled cans, making it unattractive and harder to use.

The GEA twin paddles are controlled by a unique synchronising shaft, rather than by separate belt or chain drives, which ensures that the paddles always rotate as designed and can never experience a catastrophic, and potentially dangerous, failure.

The process of ensuring a uniform mix does not stop, however, with the mixing itself. Care must be taken to ensure that the throughput of the mixer matches the capacity of downstream processes, such as conveying and packing. Product kept for long periods in bulk storage hoppers can begin to separate with heavy particles migrating under gravity. Similarly, conveying and filling operations must be performed carefully and gently to prevent damage and product separation. It is, therefore, important for the whole production system to be designed to work together to ensure the best possible security of outcome.

Liquid processing and mixing

Many food powders such as whole and skim milk, whey protein concentrates (WPC) and cocoa are used as ingredients in liquid suspensions and products such as milk-based drinks, yogurt and food applications.

These too have to be introduced into the mixer and homogenised carefully and effectively to ensure the stable shelf life and product characteristics manufacturers require.

Continued overleaf ➤

Here too the integrity of the mixer is critical. Fundamental to the Mixing Formula mixers from GEA is a high shear device that reduces oil and powder particles down to microns by forcing them through the narrow gap between the rotating (Rotator) and fixed (Stator) components, then homogenises them under extreme pressure. Tolerances are small so the mixer's design and rigidity is critical to achieving the desired result.

The key, for both the Inline Formula and Batch Formula systems from GEA, is to ensure that all the products are forced through the high shear device with tolerances so tight that there is no opportunity for any product to pass by.

To control the mechanical stress that is applied to the product when passing through the High Shear Device – the stator is interchangeable and is chosen carefully for each application. Larger particles, such as fruit or vegetables, are added to the mix later as required, as part of a low shear blending process.

The Mixing Formula Concept is often equipped with a vacuum system that draws powders into the mixing vessel under the surface of the liquid. This ensures that the powder is wetted instantly; no powder sticks to the sides of the vessel or agitator; and all powder is homogenised into the final product.

By contrast, systems in which the powder is introduced onto the top of the liquid often suffer from 'fish eyes', clumps of powder that cannot be wetted even with long periods of agitation and will not, therefore, be fully homogenised.

Mixing is the most demanding unit operation in today's process industries – and a high quality end product is dependent on efficient, successful mixing. Choosing the right mixing technology is crucial – as the mixing process not only has an impact on the processing – but also on the batch cycle times, shelf life, plant efficiency, total cost of ownership (TCO) and the working environment of employees. ■

www.gea.com

This supplement was produced by

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