tna food processing & packaging solutions

» TNA feeding ambitions

a TNA whitepaper

top considerations when selecting frying equipment

find the processing systems that fit your needs best

About the author:

Joseph Mistretta

Managing Director
Integrated Packaging and
Processing Solutions Provider TNA

With more than 40 years' experience in the design, engineering and manufacturing of industrial processing equipment for the food industry, Joseph has extensive knowledge in frying and baking, as well as speciality equipment and complete food processing systems. The original founder of FOODesign, Joseph is responsible for the general operations and management of FOODesign's product line.

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introduction

Frying is one of the fastest heat transfer methods available for cooking a wide variety of applications including meat, poultry, seafood, bakery and snack foods. In today's market, however, consumer demand is becoming much more discerning and refined – consumers not only look for food that's readily available, they want products that taste great, and exhibit a desirable colour, texture and smell for a complete sensory experience.

Implementing the right frying and processing equipment is an effective way to achieve this and can add considerable value to food products. For example, frying processes can give foods a crisp and firm outer coating, while keeping the inside tender and juicy, a texture combination that appeals to consumers. Intense flavours can also be obtained via frying due to the caramelisation of the sugars present in food.

The selection of frying machinery, however, is a multi-faceted decision and manufacturers must make sure they identify the frying system that best suits their needs. This will encompass functional and operational requirements, marketing and consumer needs, as well as legislative regulations regarding food safety and hygiene. Specifying a production line should also be considered in the context of developments in the market, since the machinery must be able to contend with or adapt to ever changing consumer demands.

1 product
finding the best solution for your product

Finding the best solution for the product or product range that is going to be processed is essential. The type of product, its sensory qualities and physical dimensions all have to be considered when selecting a frying system. Depending on the type of food category, there may be special considerations as each type of product has its own set of attributes, unique structure, weight, surface texture and topography which will determine the processing requirements. Snack foods like potato chips and tortilla chips, for example, will have entirely different processing requirements from more complex products, such as battered or breaded meats. As such, flexibility in design is key when it comes to catering for different cooking profiles.

While frying and processing equipment must be suitable for handling the specific types of food products, it should also be customised to fulfil requirements for taste, texture and visual appeal. However, the level of customisation will depend on the desired attributes of the end product. Continuous frying, for example, is more suitable for regular potato chips which are typically light in colour, crispy and finely textured. These attributes come from the potato chips being continually processed, for a short amount of time at very high temperatures. In contrast, the batch frying process cooks thicker potato slices or other root vegetables for a longer period of time at lower temperatures, producing high quality chips that are crunchier and darker in appearance. In both continuous and batch frying, maintaining precise temperature control is key for perfecting the cooking process. It is therefore important to identify the optimum product attributes from the outset so that food processing systems can be customised to fulfil these pre-determined requirements.

In addition, the desired production rate must be established to determine the appropriate fryer size and type. Typically, batch frying systems can handle capacities of up to 272 kilogrammes per hour. However, the batch-by-batch nature of the process can limit product throughput efficiency. In order to overcome this challenge, installing two or more machines in the process can help food manufacturers to maintain a continuous flow of production.

2 oil management
maintaining high product quality

Oil is one of the most important food processing ingredients on the production line, and one of the most expensive. As such, any steps processors can take to reduce loss or wastage of oil can make a significant difference to profitability. Optimising oil life is an essential part of this process and well-designed frying systems should address a variety of needs, including maintaining oil integrity.

> **"The most innovative frying technology incorporates continuous filtration systems to help remove particulate material from the fryer during cooking."**

When frying battered or breaded products, cooking oil can quickly degrade due to the fragile coating breaking away from the product. The debris left in the fryer can burn and carbonise, contributing to oil degradation. This not only damages the quality of the oil but also disrupts cooking efficiency, makes it harder to clean the fryer and ultimately compromises product quality in terms of taste, appearance and shelf life. Frying with degraded oil can also trigger serious health-related side effects caused by the increased levels of fatty acids, oxidised lipids and acrylomides in the end product.

To maintain oil quality, the excess particles left behind from coated or sliced products need to be removed from the oil via a filtration system. If these pieces remain in the oil, they will not only reduce oil quality, but also have a significant impact on fryer efficiency.

Oil pick-up and oil turnover are additional considerations when it comes to oil management. In most frying operations the free fatty acid level of the cooking oil will rise to an unacceptable level if the total volume of oil in the system cannot be turned over within a set amount of time. Turnover occurs by the pick-up of oil into the products as they pass through the fryer. Depending on their physical characteristics, most products absorb oil during the initial stages of frying, lowering optimum oil levels. Potato slices for example, take on 23 per cent of the oil, meaning 77 per cent remains after frying – this oil must be replenished with fresh oil to return levels to 100 per cent. Efficient oil turnover via fresh oil infeed is therefore critical to maintain low free fatty acid levels and optimum oil volume.

The most innovative frying technology incorporates continuous filtration systems to help remove particulate material from the fryer during cooking. Typically, the oil is passed through a filtering system to remove both large and fine particles. The filtered oil is then blended with fresh oil and pumped back into the machine to return oil levels to the optimum level. This ensures that the product is cooked in the freshest oil, assisting manufacturers to produce fried goods of the highest possible quality.

3 controls and monitoring

benefits of a flexible customised solution

Designing processing systems with integrated controls and monitoring solutions from the outset puts efficiency at the core of operations. Across the entire food industry, production lines have become increasingly complex with more and more components integrated into the same network to increase output. An effective control system is key to ensuring that the production line remains simple to use and that movement between each area is seamless. Re-tuning these control systems for specific cooking and frying applications, recipes and products enhances

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efficiency further. Good control systems gather information from the entire line and store it in a central database, allowing plant managers to monitor any unusual activities, pinpoint their location and react quickly and efficiently should an incident occur. This reduces the risk of production flow interruptions and gives operators an enhanced level of control over the quality of the final product.

FOODesign's frying systems are fully compatible with TNA's controls and integration technology, such as programmable logic controllers (PLC) and supervisory control and data acquisition (SCADA), helping to expose inefficiencies across the entire production line. These systems monitor temperature control to ensure accurate heat regulation during the cooking and frying process. Equally, conveyor drive motors are fully adjustable from a single point to allow greater flexibility in cooking time and product type and processors are able to gauge oil levels and product output precisely. This data can be used to improve transparency throughout production and inform the management of changes to improve performance.

4 maximising sustainability

increasing system efficiency

Environmental concerns continue to grow in importance and, as consumers increasingly demand the highest environmental credentials from the products they purchase, food processing specialists are stepping up to help manufacturers in pursuit of greener operations.

With rapidly increasing energy prices, keeping energy costs low is essential when trying to achieve a more efficient and sustainable production process. Green credentials must be balanced with manufacturers' needs to increase overall output, profitability and quality of finished products. While frying remains one of the fastest heat transfer methods available for cooking, efficient design of heating elements can make a significant contribution towards reducing production costs and physical footprint, without compromising product throughput and quality

FOODesign's innovative fryer design comprises smaller tube configurations to increase heat transfer, enhance system efficiencies up to 80-84 per cent and reduce overall machine footprint compared to conventional setups. In addition, the amount of tubing inside the fryer determines the fryer's overall size. As such, the less tubing required, the smaller the space and the smaller the volume of oil required to be heated, decreasing costs in terms of raw material and reducing machine footprint.

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5 food safety

achieving the highest safety guidelines

There is increased pressure on manufacturers to prevent food contamination, as contaminated raw materials and cross-contamination during production are common sources of food borne illnesses in food processing plants. Hygienic design of machinery and equipment is the basis for safe food production. Food can, for example, easily become trapped in mechanical joints, compromising hygiene. A simple design with smooth surfaces, no blind spots and no areas, such as corners in which product and microorganisms build up, can help food manufacturers adhere to increasingly strict food safety requirements.

All of FOODesign's equipment is manufactured from food grade stainless steel, making it easy to clean and capable of withstanding the impact of a high volume of hot oils and fats during processing. Moreover, all good frying systems should be designed so that any water or cleaning fluids completely drain out of the system, following the same path as the oil, leaving no area untouched. The removal of water from a fryer is critical for oil integrity, as well as for user safety. In addition, FOODesign's fryer systems are simply constructed and contain only the minimum number of moving parts, which are easily accessible to ensure the highest level of hygiene and safety. By specifying easy-to-clean systems from leading suppliers, food processors can significantly reduce the risk of bacterial growth or cross-contamination.

6 ease of maintenance
minimising downtime and repairs

Regular system maintenance is important in the food industry to ensure processes run smoothly and effectively. All equipment needs to be checked and cleaned on a regular basis to provide the highest level of food safety to protect both the consumer and a manufacturer's reputation. Scheduled maintenance is important to avoid unscheduled repairs that can have serious consequences on line efficiency and plant profitability.

> **"Both the design and material of frying systems are important factors and can help facilitate maintenance and minimise plant downtime."**

Both the design and material of frying systems are important factors and can help facilitate maintenance and minimise plant downtime. Many providers, such as FOODesign, offer systems in which major mechanical components such as drive motors and bearings are easily accessible and can be quickly removed or replaced with readily available spare parts, for minimal downtime and an uninterrupted production flow. Furthermore, stainless steel construction throughout the fryer ensures longer component life.

An effective control and monitoring system should be put in place to monitor motor currents and give advance notice of failure, effectively eliminating unscheduled downtime.

7 after-sales support
finding the right supplier

For high value equipment like fryers, the relationship between plant operator and machinery supplier should not end once the system has been installed. Working with equipment suppliers who offer a comprehensive after-sales service, no matter what the location, language or time zone, is vital to ensure that the system runs efficiently to its agreed specification.

FOODesign supports manufacturers every step of the way: from design and installation to the integration of their processing equipment into new or existing product lines. The after-sales service supplied by FOODesign includes full training, and provides operators with on site advice and support on how best to use the equipment for maximum productivity.

The company also offers a full on site audit to assess how new and existing machinery is working and identify any improvements that can be made. And for new installations, a technical specialist can stay on site for an agreed period after the installation is complete to ensure smooth running of the systems and troubleshoot any potential problems.

Ensuring your supplier has local sourcing of all spare parts is equally important. Should part of your system require maintenance, quick local access to spare parts is paramount to maintaining the productivity of the entire production line. As part of the TNA's family of brands, FOODesign has technical support operators throughout the world to deliver a rapid and expert response to customer issues and enquiries.

summary

Frying is one of the most effective heat transfer methods available for delivering unique flavours and enhanced product appearance, through colour development and surface texture, across a wide variety of applications. However, fried goods vary greatly depending on the type of product, and so too do their desired product attributes.

As a result, effective cooking and frying systems are vital to help manufacturers respond to increasingly discerning consumer demands. As well as providing flavour and texture to create a desirable end product with real consumer appeal, they can also help facilitate increased flexibility to ensure a smooth production process, help manufacturers to meet stringent food safety and hygiene regulations and maximise yield to ultimately help grow sales and increase profits.

If you would like to find out how TNA can help you choose a frying system that suits your needs then please contact us at www.tnasolutions.com or email us at tnateam@tnasolutions.com

TNAsolutions.com

TNA solutions Pty Ltd.,
24 Carter Street, Sydney Olympic Park NSW, 2127, Australia
Tel: +61 412 366 379 | Fax: +61 297 482 970 | Email: tnateam@tnasolutions.com | Twitter: @TNAsolution