

a **TNA** whitepaper

# snacks

the latest snack trends and  
the top 10 tools to meet them





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### **summary**

# introduction

Snacking has become a way of life for consumers across the globe, with the category posting an impressive 9 per cent value growth in 2015.<sup>1</sup> In particular, younger consumers regularly snack between meals. Whether they're looking for a treat, an energy boost or just something to do, the reasons for snacking are vast. The evolution of the snacks market is well under way. Once considered an indicator for an unhealthy lifestyle, fried snacks like chips now cover multiple categories. From healthy kale chips to premium truffle flavoured chips to exotic cassava chips, new product innovations in this sector have greatly expanded over the last few years, creating a very large and diverse snack industry.

With so much potential for growth, it's vital snack manufacturers have access to technology that will help them meet the demand and maximise the opportunities this flourishing sector is offering. This white paper will look into the main snacking trends and explore the technologies that snack manufacturers need to stay ahead of the competition.



<sup>1</sup> What's New in Sweet and Savoury Snacks: Opportunities Abound for a New Wave of Products, Euromonitor (October 15)

# 1

## think thin - less fat, low salt

As a result of busier lifestyles, more and more people are looking for on-the-go foods that can satisfy hunger throughout the day. At the same time, however, consumers are also becoming increasingly aware of the content of the foods they eat and how it's processed. For many consumers, less is more. Whether it's less salt or low fat, the global population is becoming increasingly health conscious. According to the latest studies, over two-thirds (68%) of UK consumers who eat potato chips and chip-style snacks say they would be interested in chips made with healthier cooking oils, such as olive oil or coconut oil,<sup>2</sup> while around 34% of global consumers think it's very important for snacks to be low in salt.<sup>3</sup>

The latest cutting-edge pre-processing, frying and seasoning technology can help snack manufacturers create products that not only appeal to the consumer preference for healthier snacks, but that maintain the distinctive taste and crunchy texture that fried snacks are famous for.

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### 1.1 pre-processing

The adoption of innovative pre-processing techniques can make a real difference when it comes to the creation of healthier chip alternatives. One of the latest solutions available to snack manufacturers is pulsed electric field (PEF) technology. PEF systems work by using pulses of electricity to puncture cell membranes and allow fluid to exit. As a result, sugar and moisture are removed, resulting in reduced acrylamide formation and improved cut smoothness. The perfectly smooth surface of a PEF-treated slice, with smaller, intact cells, inhibits excessive oil uptake while maintaining crispiness.

In addition to enhanced texture, PEF technology also aids the development of products with the visual appeal consumers expect. Colour, for

example, is often determined by the amount of reducing sugars in the product. When processed at high temperatures, these sugars caramelize and burn, leading to browning. Their removal via PEF treatment reduces the effects of caramelisation, maintaining the original vibrant colour of the raw ingredients and optimising overall appearance. This allows for the production of natural, low-fat snacks, as well as delivering the texture and visual appearance consumers desire. Other benefits include reduced frying time and a clean and energy efficient process.

### 1.2 multi-stage frying

Multi-stage frying (also referred to as two-stage frying) is increasingly used as an alternative method to straightforward atmospheric frying for the creation of healthier snack products. This tailor-made approach is broken down into two stages, the first of which is atmospheric pre-frying and the second, vacuum frying. During the initial stage, the product is fried at a high temperature for a short amount of time (45-180 seconds) to remove enzymes and sugars. This is achieved by the evaporation of 80% the moisture. The process is then completed at a lower temperature (approximately 120-130 degrees Celsius) for 10-50 seconds in a vacuum fryer. Thanks to a much gentler process, the end product upholds the natural qualities of the raw material, including nutritional value and colour, without the need for additives or colourants. At the same time, the process gives enough control to prevent discolouring such as browning or caramelisation.

Multi-stage frying is also compatible with a variety of oil types. Although today's manufacturers are inundated with a choice of healthier oils, many of these oils, such as olive oil for example, are less stable at the heating stage. Less stable means high levels of oil breakdown components when heated, thus reducing the nutritional properties of the end product. Oils that are rich in essential fatty acids and other polyunsaturated fats are the most fragile. And because their shelf life is generally shorter compared to oils that contain saturated and monounsaturated fats, snacks processed in healthier oils can become less stable during their shelf life, resulting in an off-taste, appearance and smell. In addition, these are generally more costly due to their nutritional value and provenance.

<sup>2</sup> Sales of crisps lose their crunch: potato-based snacks overtook sales of crisps in 2015, Mintel (February 2016)  
<sup>3</sup> Snack Attack: What Consumers are reaching for across the world, Nielsen (September 2014)

With multi-stage frying technology however, manufacturers are able to invest in healthier oils to add value to their product offering, since they do not degrade as quickly under the gentle processing conditions. As such, they can maintain a profitable process, as the oil does not have to be replaced as often, while also producing products with a healthier nutritional profile. In addition, the use of oils with distinctive flavour profiles, such as coconut oil or peanut oil, allows for the creation of new chip varieties with unique and authentic tastes, opening up new opportunities for snack manufacturers to market their products to the increasingly health-conscious and adventurous consumers.



### 1.3 accurate seasoning

When it comes to creating healthier snacks, maintaining taste and flavour is key. No-fat, low-fat or less salt, the secret to developing a successful snack product is good taste. Despite the recent trend towards healthy eating, flavour is still regarded more important than health factors with three in five (62%) of US consumers agreeing that taste is more important than how healthy a salty snack is.<sup>4</sup>

Seasoning has two key aspects. Firstly, from the consumers' perspective; they want a consistently flavoured product that looks good and tastes fresh. As such, manufacturers need to select seasoning systems that deliver on these desired elements, while also ensuring that the seasoning is applied appropriately and consistently. The second aspect affects label declarations. For this, manufacturers need to ensure that only the right amount of seasoning is applied, in particular when they're intending to profile their product as low in sodium.

There are a number of innovative technologies that allow manufacturers to better control the application process for greater accuracy and reduced waste. On-machine seasoning systems that feature a responsive variable mass seasoning system with dynamic vibratory weigher are able to directly control the powder flow into the drum. This enables an accurate, proportional amount of seasoning to be evenly applied to the product for improved coverage and flavour dispersion. Selecting the best application system will enable manufacturers to apply as much as

they need for taste, accuracy and consistency. Plus, if they can prove they only applied what was necessary, then their declaration is kept to the minimum, instead of declaring the worst case scenario.

## 2 superfoods, super snacks - the new kids on the block

Although the potato is still one of the most popular ingredients when it comes to chips, the idea of superfood vegetable chips is gaining ground.<sup>5</sup> In particular, younger consumers are open to new product formulations with healthier ingredients to reduce the guilt associated with snacking. According to research, over a third of Americans would feel less guilty about consuming unhealthy foods or drinks if they contained a healthy ingredient.<sup>6</sup>

Snack manufacturers are catering to this demand by incorporating alternative ingredients and raw materials, such as kale, parsnip, beets or spinach for example. Often more nutritious than regular

**“Over a third of Americans would feel less guilty about consuming unhealthy foods or drinks if they contained a healthy ingredient.”**

<sup>4</sup> Stressed out Americans are driving the US salty snack market, Mintel (May 2016)

<sup>5</sup> Crisps, Savoury Snacks and Nuts 2016, Mintel (January 2016)

<sup>6</sup> Everything is a snack – Modern Day Snacking in America, Canadean (June 2016)

chips, they pack more flavours and tastes, which explains their popularity. But it's not just 'super' vegetables, fruit chips, such as banana, kiwi or mango are also becoming increasingly popular and have slowly started replacing the less healthy varieties.

Creativity is key in today's snack industry and manufacturers continue to look for new and innovative ways to fry their products. In particular, fruit and vegetables that contain high levels of moisture, amino acids and reducing sugars, like fructose for example, can pose a challenge to traditional frying methods as these ingredients aid the formation of acrylamide. As a result, innovative frying technology is becoming increasingly popular across the industry.

## 2.1 vacuum frying

Unlike multi-stage frying, vacuum frying continuously cooks products under a low temperature and low pressure conditions from start to finish. At these low temperatures (below 100 degrees Celsius), the degradation of the product's surface structure is reduced, lowering the amount of oil absorbed and therefore enabling significant fat reduction with minimal impact on product quality. The low temperatures and the lack of oxygen present in the system also make it possible to use high quality, zero trans fat oil varieties leading to a longer shelf life and cost savings.

Vacuum frying systems are ideal for producing chips from fruit and vegetables that are high in natural sugars, such as parsnips, beets, carrots, apples, kiwifruit or mango, since temperature-related reactions, such as acrylamide formation, are slowed down significantly and in some cases do not occur. The low temperatures also help to preserve the colour of the raw ingredient since caramelisation does not occur. Furthermore, because the movement of moisture is less forceful during vacuum frying, products are able to retain more of the flavour inherent in the raw ingredients. This allows producers to meet consumer trends for healthier, low fat products with natural and authentic organoleptic properties.

## 2.2 batch frying

Batch frying is an additional technology which is currently being explored to produce healthier vegetable and fruit snacks. In particular, if the fruit and vegetables contain high levels of starch

and/or reducing sugars like beets, bananas, cassava or carrots for example. In comparison to continuous frying processes where products are cooked at high temperatures (approximately 180 degrees Celsius) for a short amount of time, batch frying involves cooking at 140 degrees Celsius for a longer length of time. At these lower temperatures, acrylamide formation is reduced, creating safer fruit and vegetable chips.

As well as helping to produce safer products, batch frying is also proven to reduce fat content via reduced oil uptake during processing. The starting temperature of a batch fryer is usually approximately 140 degrees Celsius. As the product is added to the fryer, the overall temperature of the oil kettle drops to approximately 110 degrees Celsius. The extra low temperature helps to seal the outside cells of the product, preventing oil absorption. This avoids excessive oil uptake, allowing manufacturers to market their products as "reduced fat".

Texture is the most important factor in batch frying. For all types of chips, a very crunchy texture, often described as "glassy" or "hard", can be achieved, which is often associated with high quality, premium-style products. This is a result of the overall temperature drop in the fryer when the product is added to the kettle. As it is fried off, moisture within the slices starts to boil. The boiling effect opens up the structure within the cells, and as the product dries toward the end of the process, the structure strengthens and becomes hard. This structure creates the well-known "crunch" or "bite" consumers associate with batch-fried chips.

**"Consumers have started looking for smaller bags of healthier treats that can easily be consumed while on-the-go."**

## 3 less is more – controlled snacking

As people grow more health-conscious and convenience-driven, consumers have started looking for smaller bags (150-275 grams) of healthier treats that can easily be consumed while on-the-go.<sup>7</sup> For many of them, portion

control has become the chosen path to reduced weight and a healthier lifestyle and small, single-serve bags are a convenient way to achieve this.

The consumer move to on-the-go snacking and healthy eating has had a considerable impact on packaging processes as manufacturers need to package the same amount of product in more bags to retain the same levels of production volumes. Maintaining ambitious throughput targets and optimum productivity are therefore crucial. But when it comes to selecting the right vertical form fill and seal (VFFS) equipment, it's important to not just look for high bagging speeds. A low reject rate, high level of flexibility, ease of maintenance, operation and integration, and a low environmental footprint are all things to consider before specifying a new machine. Today's snack manufacturers need a packaging system that can operate at maximum speeds, while also delivering the highest level of overall equipment efficiency (OEE).

### 3.1 turnkey packaging

Line integration is the first step towards operational efficiency as it enables each component to communicate effectively with the others. Nowadays an increasing number of OEMs will offer a wide range of integrated innovations that support flexibility and speed during the packaging process. From precision scales to high-speed metal detectors to automated film splicers, the move from specifying a single product to a complete packaging system can be witnessed across the entire food industry.

Turnkey systems also help towards improving system integration. Many snack manufacturers undervalue the importance of taking a step back and looking at the complete line. For example, a bagger may be able to pack bags of potato chips at a rate of 150 bags per minute, but if the scale can only handle 80 weighs per minute, then the overall productivity will be reduced. Manufacturers must ensure that all elements of the production line can achieve similar levels of outputs to boost their overall efficiency. By specifying complete turnkey systems from one supplier, manufacturers can ensure that their production processes operate at maximum performance as each machine is typically designed, assembled and installed so that individual components will work efficiently with one another, delivering the best results possible.



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### 3.2 flexible equipment

Packaging performance is also closely related to equipment flexibility. Consumer tastes and preferences change quickly and in order to keep up with the latest trends, snack manufacturers need equipment that can offer the highest level of flexibility when it comes to handling new materials, package sizes and varying line speeds. It's no longer enough to have a great tasting product. Snack manufacturers that really want to stand out also have to take consumers' visual preferences and values into consideration – whether this means the use of sustainable packaging materials, an eye-catching design or an innovative shape. By adapting the packaging design and look of their product, manufacturers can easily update their portfolio to ensure they maintain visibility and relevance in the market place without having to reformulate the actual product itself.

The latest VFFS technology has been designed to support these requirements for flexibility. No mechanical adjustments are needed when changing product or film for example, plus digital data settings have been incorporated into the

system for rapid product or pack changes. Many systems now allow for quick former changes and any combination of jaw size or configuration (rotary single, double, triple or rotary flat jaw), granting full flexibility of bag size and format, film type and application on a single system. In addition, quick access to system components and a hygienic design are also paramount as they enable food manufacturers to easily clean, repair or exchange faulty parts, minimising maintenance and plant downtime. Many VFFS packaging systems now feature quick wipe down stainless steel surfaces with free-standing components which can be easily removed, cleaned or swapped can further avoid disruptions. That way, snack manufacturers can be sure they are able to respond to consumer trends quickly and efficiently without having to make costly and time-consuming changes to their production setup.

## 4 safety first - tackling traceability

Consumer safety is key when it comes to food processing. However, recent food scandals have rocked consumer confidence and many now want to know more about the food they eat than ever before. Latest US consumer studies reveal that 94% of respondents feel it's important that the brands and manufacturers they purchase from are transparent about what's in their food and how it's made.<sup>8</sup> Today's consumers demand more and the implications for failing to deliver can be costly, both from a revenue and a brand perspective.

But it's not just consumers who have become more concerned about food safety – new legislation targeted at improving transparency and safety standards across the entire supply chain is being implemented across the globe. In the US, the FDA introduced the Food Safety Modernisation Act (FSMA) in 2011, which spans from the source to the processing and packaging stage. This new act builds on existing Hazard Analysis Critical Control Point (HACCP) rules, which have been the defining standard for food safety management since the 1960s. In the EU, implementing traceability systems has been compulsory since 2002 and incorporates the need to keep records to monitor product and ingredient movement. As with US regulation, importers are similarly affected as they will be

required to identify from whom and where the product was exported.

As a consequence, transparency is no longer optional, but has become mandatory for many snack manufacturers if they want to retain brand loyalty, comply with regulation and continue to operate safely on an international scale. There are a number of tools that can be easily integrated into existing snack processing and packaging lines. With a holistic track and trace approach, snack manufacturers can identify, monitor and mitigate weak links in their production processes that will help them improve efficiencies and gain a competitive edge.

### 4.1 controls technology

Automation is a key component when implementing traceability. Food safety can be assured by improving in-line checking throughout the entire processing and packaging line, facilitated by the adoption of a fully integrated control system. Product quality issues can apply to both raw materials and finished products, and are often caused by badly specified, outdated or poorly configured control systems. By integrating systems that can be easily validated, it is possible to obtain essential monitoring data that will satisfy traceability requirements.

Detailed and reliable information from as many parts of the production process as possible should therefore be collected and thoroughly evaluated. Good control systems store information from the entire line in a central database, allowing plant managers to filter the data and create configurable reports to demonstrate trends and increase control over the process. Known as a Human Machine Interface (HMI), this technology provides status and production data, enabling operators to monitor any unusual activities and react quickly and efficiently should an incident occur to ensure that production is not affected.

Using an effective tracking system to batch monitor any goods-in, control existing stock and keep up to date on products' shelf lives, will help reduce raw material wastage, make inventories more accurate and maintain product quality at all times. In addition, with production tracking software, food processors can monitor and record information about their processes enabling them to rectify any issues, and have the documentation available to meet new record keeping requirements. Not only does this speed

up production, but it also creates a greater level of transparency and accountability within the manufacturing process.

#### 4.2 metal detection

Detecting foreign bodies within the production line is of primary importance, and metal is one of the most commonly found contaminants in food products. Metal detection technology allows processors to identify potential risks in products and ensure consumer safety. The chosen equipment must be sensitive and reliable so that nothing is missed that could harm consumers. At the same time, it must also reduce the risk of false detections to minimise product waste and operate at high speeds to ensure that productivity is not adversely affected.

The most important factors affecting metal detection capability include the type of (metal) contaminant being detected, the aperture size and the type of packaging material used. Best practice is to test equipment using three contaminant types – ferrous, which is relatively easily detected, non-ferrous, and the most challenging to detect, non-magnetic stainless steel. These metal types represent all possible metal contaminants encountered in food manufacturing processes. Contaminant size also affects the probability of the contaminant being detected. The latest innovations in metal detection are capable of identifying ferrous metals from 0.8mm to 0.9mm, non-ferrous pieces down to 1.0mm and non-magnetic stainless steel from 1.0mm to 1.2mm. In addition, the product's packaging material can also affect the accuracy of the metal detector. Metallised film, foil, cans and packages with metal ties or clips can make it more difficult for contaminants to be detected.

Today, engineering and software improvements continue to set new standards in food manufacturing, meaning that processing lines are capable of operating at unprecedented speeds. Detection systems must be capable of performing accurately at these high speeds without decreasing productivity. The most innovative metal detection technologies comprise a fully integrated design that provides a single point operation from the packaging system screen. The metal detector is positioned close to the multi-head weigher, taking advantage of the path that the product is already travelling. This allows the detector to run at much higher



speeds, dramatically increasing the rate at which the bagger can produce finished products, while maintaining high sensitivity levels. Detection of a contaminant immediately signals the packaging machine to stop or double bag to ensure the contaminated product is isolated or immediately rejected and removed from the processing line.

#### 4.3 verification

Most governments have set strict rules around the need for accurate labelling. Verification systems like automated barcode scanning and in-line monitoring systems ensure products comply with specification and adhere to all food safety regulations, with accurate labelling to correctly identify what is within the packaging. Date coding all products that move through the production line is also imperative. Assurance systems should accurately and reliably find miscoded or uncoded products. By processing the data code images through a sensitive camera system, it's possible to check that date codes are printed, complete and legible. This ensures that they are clearly marked, reducing the risk of incorrectly labelled goods entering the market.

Barcodes are a simple and cost-effective way to implement traceability at the item level. Production data, such as time to market and product quality, can be built into the code to allow for easy tracking of each product. Barcode scanning systems should incorporate a full film width barcode reader to automatically scan product film and cross check it to verify that the correct product is being processed to ensure the highest product safety levels.



## summary

The snack industry is evolving at a rapid pace. Whether it's the demand for healthier snacks, superfoods, smaller bags or greater transparency, consumer preferences are changing, putting pressure on manufacturers and their current production processes. With the right cutting-edge technology in place and a partner they can trust, snack manufacturers can stay one step ahead of the latest trends and turn their challenges into opportunities.

If you would like to find out how TNA can help you choose a the right solution that suits your needs then please contact us at [www.tnasolutions.com](http://www.tnasolutions.com) or email us at [tnateam@tnasolutions.com](mailto:tnateam@tnasolutions.com)

TNA is a leading global supplier of integrated food packaging and processing solutions with over 14,000 systems installed across more than 120 countries. The company provides a comprehensive range of products including materials handling, processing, cooling and freezing, coating, distribution, seasoning, weighing, packaging, inserting and labelling, metal detection and verification solutions.

TNA also offers a variety of production line controls integration & SCADA reporting options, project management and training TNA's unique combination of innovative technologies, extensive project management experience and 24/7 global support ensures customers achieve faster, more reliable and flexible food products at the lowest cost of ownership.

