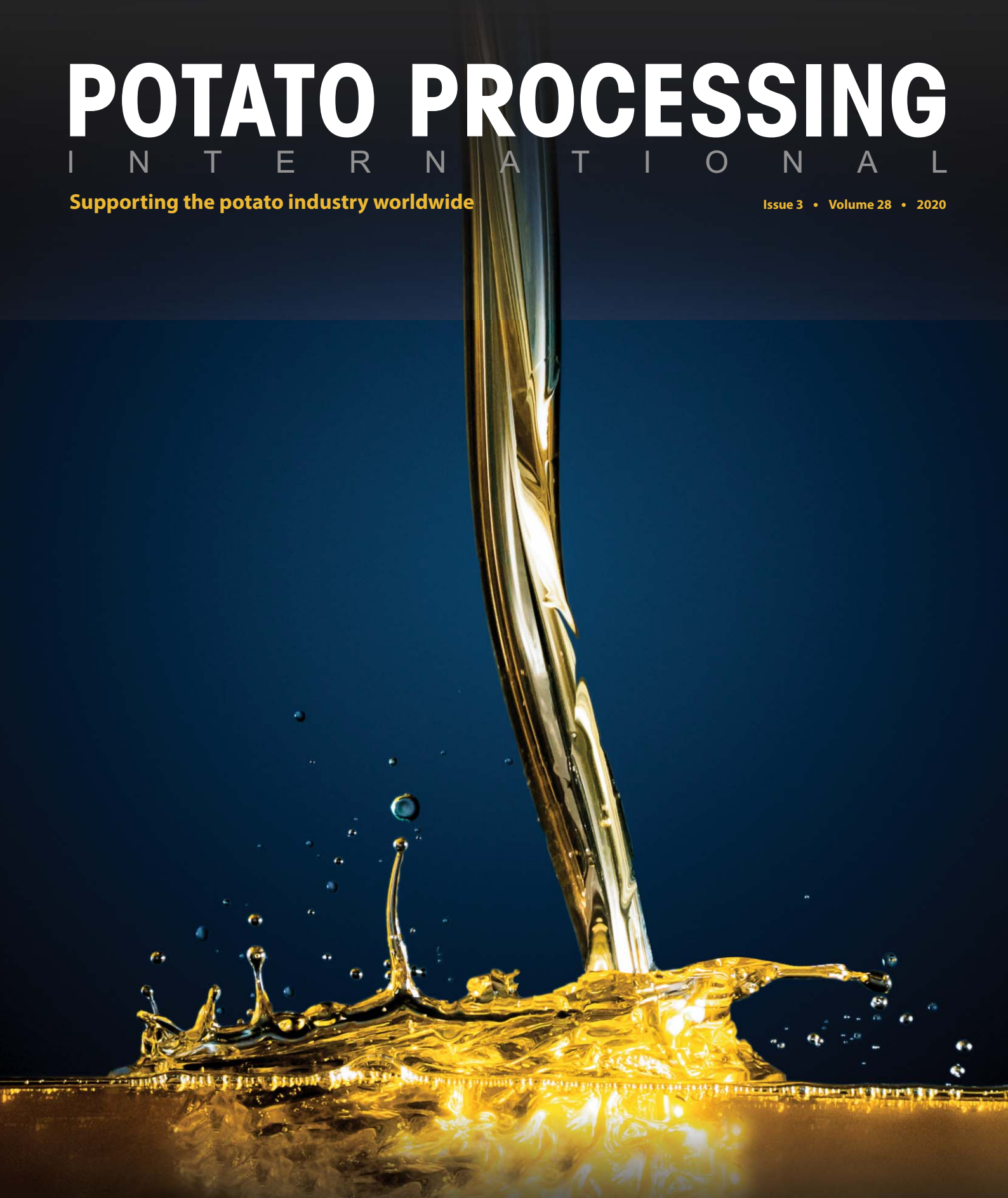


POTATO PROCESSING

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Supporting the potato industry worldwide

Issue 3 • Volume 28 • 2020



Process - Frying

Finding the Right
Solution Is a Top Priority

Process - Oil Filtration

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a Main Ingredient

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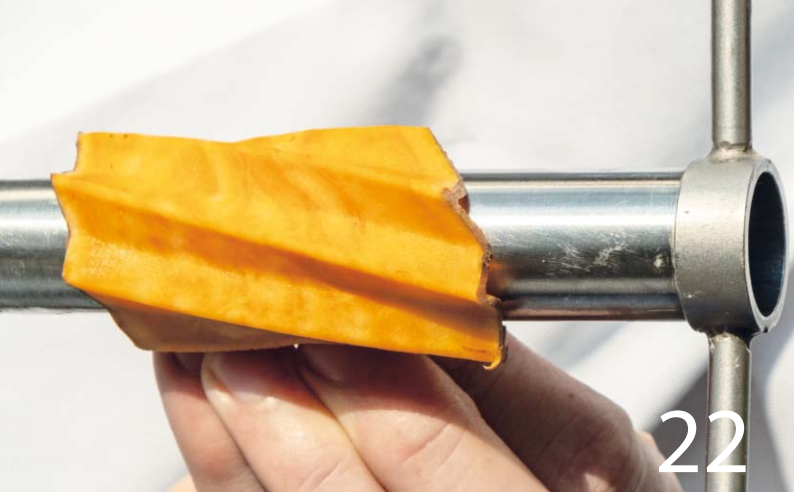
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WARNING

Consuming this product can expose you to acrylamide, which is known to the State of California to cause cancer.



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Where Do We Go from Here?

Dan Orehov - Managing Editor

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To say that the potato industry, from farm to fork, has been severely affected by the COVID-19 pandemic is probably an understatement. Storages in many parts of the world are full, the foodservice industry was unable to receive potato supplies because outlets were shut down, while at the same time some processors decided to return high-volume batches of potatoes, because of the pandemic. So, what's to come? Experts say that over the course of the lockdown, processors have reportedly operated a lower output with reduced labor in accordance with social distancing guidelines. Many have opted to close certain product lines to reduce workloads. Processor-held stocks and contracted movement has made up the bulk of the processing sector trade the past two months, while the lack of free-buy trade has translated to a build-up in supply available. There has also been reports of difficulties sourcing product packaging, which has affected overall output. In the UK, AHDB specialists say that a continued loss in foodservice is expected through to the end of the season. However, based on Kantar data, one can notice an uplift in

One can count on lockdown measures easing off and the foodservice industry returning with restaurants, pubs, bars, fast-foods open for business.

retail sales of processed products. The same goes for frozen potato products, whose volumes have consistently been above last year since the start of March. While it is difficult even for the savviest industry representatives to accurately predict how the industry will react for the remainder of the year, there are a number of factors to be aware of, that can alter the supply and demand picture in the coming weeks and months. Among these, one can count on lockdown measures easing off, likely enabling

more businesses to open and permitting the general public to travel for 'unessential journeys', but also the foodservice industry returning with restaurants, pubs, bars, fast-foods open for business. Other aspects to consider include the planted area for the 2020 harvest, but also the carry-out of existing crops from this season, that maintain market quality.

You can read more on estimates for the entire industry in this issue and can send your thoughts on the pandemic and its effects on your own business at dan.orehov@trade.media.

Stay safe! ●

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Robot Helps HZPC Fight Potato Diseases

HZPC is employing the services of a specialized robot in its fight against potato diseases and viruses, within its breeding program. In combination with marker technology, this supports the quicker development of resistant potato varieties, so that lower levels of pesticides are required and crop losses are kept to a minimum, the company says. HZPC adds that disease resistant varieties are an important step towards worldwide food security and sustainable potato growing. HZPC has had varieties with resistance to 'G. pallida' for the past few decades, and now it is also introducing varieties with a high level of resistance against 'Phytophthora' (late blight), virus and

wart disease (potato cyst nematode diseases). The aim is to ensure that three-quarters of new HZPC varieties are resistant to 'Phytophthora' and the 'Y-virus' by 2030. In this variety development process, DNA-marker technology – which extracts DNA from a potato plant in order to evaluate all its characteristics – is vital. One plant's cells contain around 40,000 genes and characteristics. The more information is known about this molecular information, the more successful the breeding processes will be. In HZPC's R&D laboratories in Metslawier, potato varieties are developed and improved and a specialized robot is helping to provide insights into plant DNA. The company's



representatives say that within 15 minutes, the robot can isolate the DNA of no fewer than 1,536 potato plants. HZPC built the robot to its own designs in order to gain molecular information more quickly. Breeding involves highly accurate, precision processes, and the use of the robot and marker technology has allowed HZPC to accelerate the process considerably. As precision and growing volumes are significantly increased, the chances of finding improved new varieties are also increased.

Frito Lay Brings Back BLT Flavor



One of UK's leading independent snacking companies has marked the next stage in its growth towards GBP100m worth of sales by 2022, announcing nationwide distribution of Burts Potato Chips through the Costa Coffee chain. According to retailtimes.co.uk, Burts Snacks has revealed the new listing following its GBP7m investment into the business last year. This aided the introduction of a range of new frying and popping techniques across its two

manufacturing facilities, helping Burts to satisfy increasing demand for its unique products. The Plymouth and Leicester based business forecasts sales of GBP54.3m by the end of this financial year, as it continues to outperform in the chips, snacks and nuts category. Burts Snacks' top-selling hand cooked chips, Burts Potato Chips, will be available in four flavors – Sea Salt, Sea Salt & Malted Vinegar, Mature Cheddar & Spring Onion and Sweet Chilli – at Costa Coffee stores across the UK from March 2020.

Eric Tavoukdijan, commercial marketing director at Costa Coffee, commented: "At Costa Coffee, we're passionate about providing our customers with the highest quality produce and are constantly on the lookout for innovative products from provenance-based, authentic brands, that will appeal to everyone who walks through our doors."

McCain Foods GB Adopts Restrain as CIPC Replacement

McCain Foods GB, the UK business of the world's largest producer of frozen potato products, has been using ethylene for a few years and is now recommending Restrain ethylene generators to its potato growers in the UK as its preferred replacement, for the soon to be withdrawn CIPC. This makes McCain GB one of the first major potato processors to embrace ethylene as a replacement for CIPC. This has been the standard in the potato sector for decades, however, the sprout inhibitor has not had its approval renewed and will not be allowed in any member state of the European Union from this coming storage season. The final use date of CIPC is October 8, 2020, but many countries and parts of the supply chain are saying it should not be used on the 2020 crop. In the UK, McCain is now opting for the anti-sprouting treatment Restrain, a residue-free, ethylene gas-based anti-sprouting system. Ethylene is a natural gas, which suppresses cell growth in potatoes. By dispersing ethylene to a precise protocol during the storage period, sprouting is reduced or prevented. "At McCain, we've been closely following the development of Restrain and using it on commercial scale for a number of years. We have carried out multiple, comparative trials on the effectiveness of this sprout suppressant and tested how it affects the fry color of our potato varieties. Our trials have been successful so, in storage season 2019/20, all our medium to long term storage has been kept with ethylene and we are now encouraging our growers to use Restrain as a sprout suppressant", says Jeff Beever, agronomist at McCain Foods (GB).



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Bs Cocinados, S.L. Installs the **New Tomra 5B Sorter**



Cocinados, were already familiar with the efficiency of the Tomra 5B, a top-of-the-range vegetable, potato and fruit sorting machine. This time, at their plant in Funes, they needed to enhance the quality of the peeled and sliced potatoes used in Spanish omelets, eliminating defects of any kind. Hilario Zapata, director of operations at BS Cocinados, said: "By opening this new plant, which involves an EUR18m investment and 150 new direct jobs – not to mention indirect jobs – the company will increase its production capacity by 30%. We will also be able to access international markets thanks to the exclusive cutting-edge technology we have bought, such as the latest version of the Tomra 5B. By using this sorting machine, we know we are offering the

best product on the market." Julián Pereira, technician and sales engineer for Luciano Aguilar, said: "In light of the successful incorporation of the Tomra 5B optical belt sorting machine at the Corella plant in 2017, and the consequent improvements in sorting compared to their previous supplier, BS Cocinados came back to us looking for the same solution as two years ago: removal of defects, mainly around the edges, in the sliced potato. By buying this new machine, they are guaranteed to produce a zero-defect potato: no green skin and no rotten or dented potatoes." According to the manufacturer, the Tomra 5B sorting machine is at the top of the charts in potato and vegetable processing industries around the world.

The new plant in Funes (Navarre), which produces ready-made Spanish Omelettes, is a project which will significantly increase production capacity at BS Cocinados, S.L. Having bought a sorting machine for their plant in Corella, Navarre, back in 2017, BS

Raytec Vision Introduces Remote Technical Assistance



Raytec Vision recently introduced its remote technical assistance system called RayAction. The service provides customers with remote technical support on installed machines, thus enabling efficient technical assistance service both to its operators present all over the world, and directly to the customer to monitor the performance and solve any problems on the machines installed. Raytec has created an electronic device called RayMote that allows communication between any Raytec Vision machine and its technical support to grant rapid and effective remote assistance. Thanks to this device, already present on over 700 machines, the sorters or inspectors connect to the company network via cable or Wi-Fi, through a secured connection, and,

together with an operator present at the machine, it is possible to adjust the vision parameters, regulate recipes, run diagnostics, retrieve statistical and performance data. Another novelty is the possibility of receiving assistance using any smartphone with an APP that allows the transmission of machine images directly to the Raytec operators in order to get an immediate overview of the problems encountered.



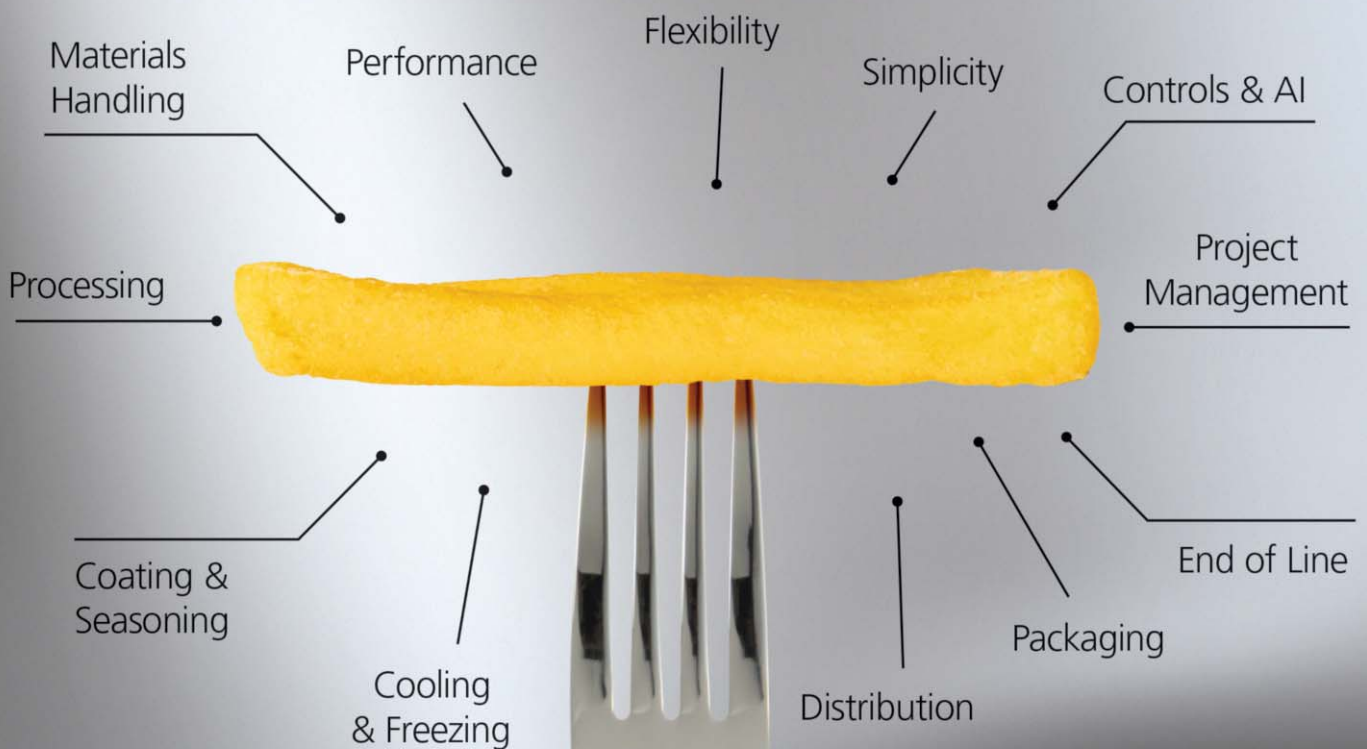
McDonald's Canada Launches 'Fries for Good' Initiative

McDonald's Canada recently announced 'Fries for Good', a nationwide initiative to support COVID-19 relief efforts and other recent Canadian tragedies. From May 8-21, 2020, McDonald's Canada will donate a portion

of the proceeds raised among these various funds, ensuring support for individuals and families across the country that need it most. Support will be directed to those affected by the pandemic, as well as those impacted by recent devastating events, including the Nova Scotia mass shooting, and other disaster preparedness and response efforts in communities across Canada. "With several recent tragedies adding to the hardships already created by the current global pandemic, we wanted to find a way to rally Canadians and support our communities that need it the most right now," said John Betts, President and CEO, McDonald's Canada. "The Fries for Good initiative provides a simple and easy way for all Canadians to contribute to relief efforts coast-to-coast." Fries for Good is also a way for McDonald's Canada to continue showing support for Canadian farmers.

of the proceeds from all fries sold in Canada to the Canadian Red Cross, supporting the Canadian Emergencies & COVID-19 Response Fund, the Nova Scotia Stronger Together Fund, and disaster response and preparedness work across Canada. Money raised by Canadians as part of the 'Fries for Good' initiative

the perfect bite



We put a lot into this one perfect fry.



AVR Introduces Three New Planters



This month, producer of potato cultivation machines AVR will be introducing three new planters: the Ceres 200M, Ceres 200H, and Ceres 440. The highlight of the Ceres 440 is its AVR Connect system, which unites all planting information and remote parameters in one digital platform. The AVR Ceres 440, based on the Ceres 400, is a four-row mounted planter that is both available as a hydraulic and mechanical version. With the Ceres 440, AVR purposefully opts for ISOBUS control and a row-independent hydraulic drive. A wide bunker ensures smooth loading. The Ceres 200M is a mechanically driven, two-row mounted planter. The planting system is based on the same principle as used in the entire AVR Ceres line, but in this machine, it has been reduced to its simplest form. Available options are lighting, two types of fixed bunkers (750 kg and 1,300 kg), electrical agitators in the cup

belt, a ridging hood and a fertilizer unit. The Ceres 200H is a two-row planter equipped with nearly all features its larger siblings have to offer. If one is restricted to two-row planting after destoning, all functionalities of the four-row machines can be reduced to a two-row width. Like the M version, the Ceres 200H is two-row mounted planter, but in this case, the machine is driven fully hydraulically and comes with a comprehensive technology package and a larger bunker. This machine is designed for planting in preconstructed beds, i.e. mainly for situations where the soil is “destoned”. “In 2019 we have extensively tested our machine prototypes. As the results were very positive, we are confident to introduce about a dozen of pre-series planters of each type for the 2020 planting season. We are looking forward to starting series production in 2021,” says AVR Product Manager Pieter Galle.

McCain Postpones Othello Potato Processing Plant



McCain Foods decided to temporarily suspend a USD300m expansion of a plant in the Adams County community of Othello, US, that would have produced French fries from potatoes grown on 11,000 acres, according to Chris Voigt, executive director of the Washington Potato Commission. The Associated Press reports that without a major reversal of demand, 1 billion pounds of Washington potatoes - 10% of last year's USD845m crop - could still be piled up in warehouses later this summer as the new crop starts to be harvested. The federal Agriculture Department in April announced a USD19bn coronavirus emergency program that includes provisions to buy farmers crops and make them available to those in need. But it is uncertain how much of a dent that federal spending will make in the huge potato surplus, and some could end up being discarded on a scale never seen before in the Pacific Northwest. The expansion was to add another 170,000 sq. ft. to the existing plant and include a state-of-the-art battered and conventional French fry processing line. The new capital injection by McCain was set to create an additional 180 jobs in the community. The added capacity required an approximate 11,000 acres, sourced from local potato growers in the region. It followed a similar expansion in Burley, Idaho to service the U.S. and global markets.

Heat and Control Launches New Oil Filtration System

Heat and Control, Inc. recently released the OilSaver Filtration System to its Oil Management System lineup. The OilSaver extends the life of frying oil with continuous high efficiency filtration down to 10 microns. It preserves frying oil quality by removing solids (coating, crumbs, etc.) using high efficiency filtration during production, while the fryer is in use. The OilSaver can be used with any fryer and keeps frying oil in good condition for coated protein products, peanuts, snack foods, appetizers, and other fried foods. In addition, OilSaver's vacuum technology makes it the safest option on the market with no chance of spraying dangerous, hot oil from the system. “This latest addition to Heat and Control's catalogue advances our oil filtration capabilities and provides our clients with a safer option for manufacturing facilities,” says James Padilla, director of Product Development at Heat and Control Inc.

The equipment accommodates up to 60 gallons per minute in a small area, while the dry cake discharge recovers large quantities of oil and returns the recovered oil back to the fryer. Heat and Control's oil management solutions provide advanced control over oil heating, filtration, transfer, cooling, and storage, as well as rapid oil turnover rate, assisting in the creation of fresh products.



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Finding the Right Solution Is a Top Priority

The selection of frying equipment is a multi-faceted decision and manufacturers must make sure they identify the frying system that best suit their needs – this encompasses functional and operational requirements, marketing and consumer needs, as well as legislative regulations regarding food safety and hygiene.

By Dan Orehov

Finding the best solution for the product or product range that is going to be processed must be a top priority. The type of product, its sensory qualities and physical dimensions should be considered when selecting a frying system. Since different products types have their own set of attributes, unique structure, weight, surface texture and topography, this often determines the processing requirements and cooking profile. In addition, frying equipment is often customized to fulfil specific requirements for taste texture and visual appeal. Continuous frying, for example, is more suitable for regular potato chips which are typically light in color, crispy and finely textured. Meanwhile, batch frying process is typically used to produce high quality batch chips that are sturdier and darker

in appearance.

Desired production rate must also be established to determine the appropriate fryer size and type. For lines running multiple products, the fryer capacity is tuned to meet the required production output for the product that the customer runs most of the time. When it comes to running multiple products on a single line, ease of operation and the ability to make quick changeovers are important considerations too.

Ease of cleaning and maintenance is an additional consideration when specifying a frying system. With the prevention of food contamination top of the agenda for any brand, procuring equipment with a hygienic design is a key priority. Food can, for example, easily become trapped in mechanical joints, compromising hygiene. A sanitary 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. 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. By specifying an easy-to-clean system, food processors can significantly reduce the risk of bacterial growth or cross-contamination. Oil management is an additional consideration when it comes to reducing oil loss or prolonging oil life. Manufacturers should therefore look to specify frying equipment that supports best

practice when it comes to oil turnover time and oil filtration. 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.

EQUIPMENT DESIGN FLEXIBILITY

According to Fransien de Graaf, Product Manager-Processing, tna solutions, industrial fryers are designed for either batch or continuous operations. In addition, oil in the fryer can be heated directly or indirectly. In a direct heated fryer, oil is heated in the fryer by an internal heat transfer mechanism – such as gas-fired burner tubes, thermal fluid tubes or electrical heating elements located beneath the vessel. With indirect heated systems, oil is continuously taken out and returned to the fryer kettle, after passing through a filter and being heated in an external heat exchanger (powered by steam, thermal oil or electric).

In batch operations, oil is typically heated to the desired frying temperature at which point the product is placed in the fryer. The temperature of the oil in the kettle then drops rapidly to cook the product at a low temperature (140C), eventually recovering to the original temperature. The cooking temperature and amount of oil in the fryer can be maintained at a desirable level by automatic controllers. In this instance, the control system and burner selection are responsible for the accuracy of temperature control tailored. Continuous fryers may incorporate either direct or indirect heating configurations. Here, the product is fed from one end of the fryer to the other, continuously. In such

systems, ensuring constant oil velocity around the product for optimum heat transfer is critical to achieving a consistent, high-quality product. For this reason, leading fryer designs contain multiple heating zones along the length of the fryer kettle. Each zone has a controlled oil inlet and outlet for optimum oil flow throughout the fryer kettle. With outlets in each zone, oil is continuously drained from the system removing all fines and particulates, while freshly filtered oil is injected to maintain optimum oil temperature over the fryer length. Accurate temperature control of the fryer's heating system ensures the oil temperature remains constant during cooking. "tna offers a comprehensive range of frying equipment, that includes continuous and batch fryers. Our leading batch frying model, the FOODesign batch-pro® 12, is suitable for frying a wide selection of vegetable chips including potato, taro, banana and plantain. Featuring a high-efficiency, serpentine heat exchanger tube configuration, the FOODesign batch-pro® 12 offers direct-fire heating with better efficiencies and

lower operating costs. The fryer's advanced system is also designed with a high-speed, two-stage oil filtration that extends the life of the oil and maintains product consistency. The system also includes an automatic stirrer that is driven from both sides to eliminate racking and prevent damage to the transport system," de Graaf says. "Meanwhile, the Florigo conti-pro® 3 range of atmospheric continuous fryers is an innovatively designed system featuring patented opti-flow® technology. Opti-flow® ensures optimized oil and product flow to ensure products meet high-quality standards. 99% of cyclone dead spots caused by turbulence are eliminated at the start of the frying process, ensuring a reduction in rejects at less than 3%. Designed with a multi-flow oil injection system and automatic temperature control, the Florigo conti-pro® 3 allows complete control over the frying process for consistent potato chip texture and quality," he adds.

OIL REMAINS AN IMPORTANT CRITERION

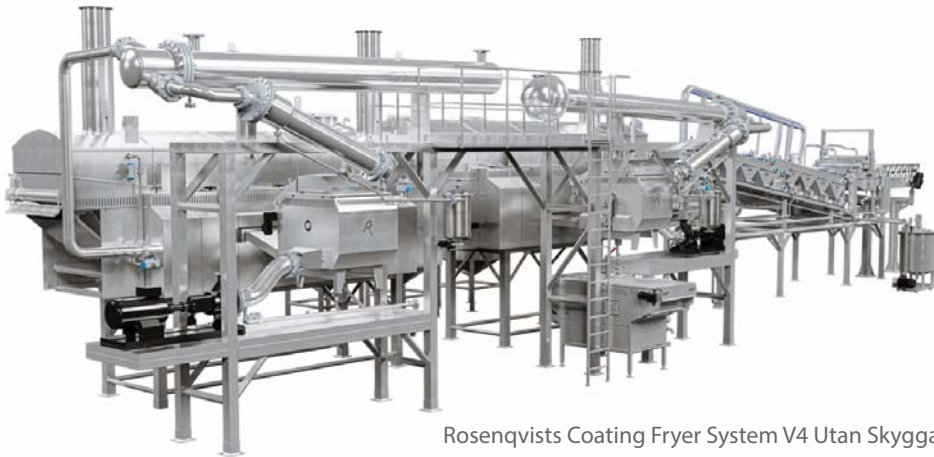
As Göran Wadsten, sales manager, Rosenqvists Food Technologies AB

“Designed with a multi-flow oil injection system and automatic temperature control, the Florigo conti-pro® 3 allows complete control over the frying process for consistent potato chip texture and quality.”

Fransien de Graaf, tna

tna Florigo Conti-pro FF 3





Rosenqvists Coating Fryer System V4 Utan Skygga

“The more total oil volume, the longer oil turnover rate will be, which increases the risk of being forced to waste the vegetable oil due to too high FFA (Free Fatty Acid) levels. We have developed an FFA simulation program which gives an indication/ prediction of the developments of the FFA value under different conditions.”

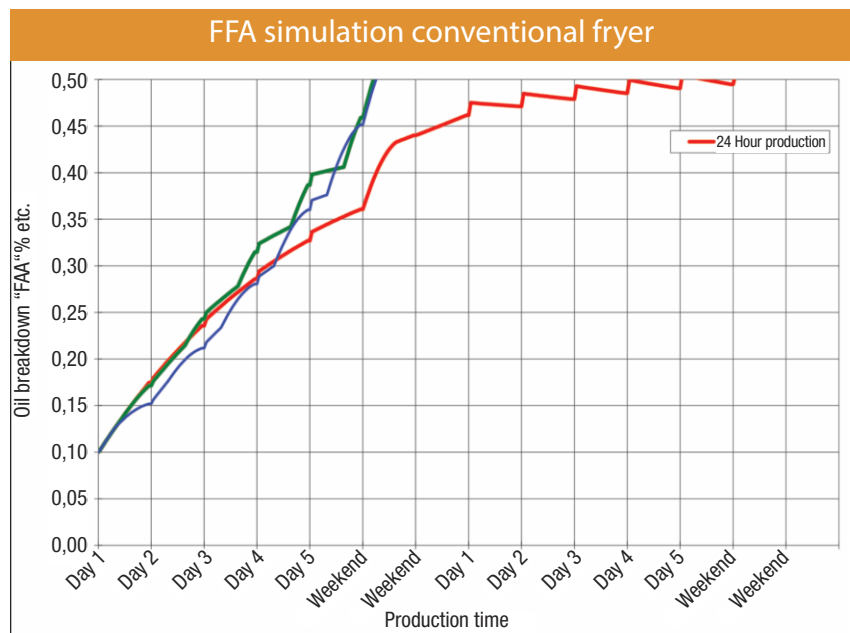
Göran Wadsten, Rosenqvists

explains, one of the most important criteria when selecting a fryer is the amount of total oil in the full system (pan, oil filtration system, heat exchanger, piping).

“The more total oil volume, the longer oil turnover rate will be, which increases the risk of being forced to waste the vegetable oil due to too high FFA (Free Fatty Acid) levels. We have developed an FFA simulation program which gives an indication/ prediction of the developments of the FFA value under different conditions. The breakdown of vegetable oil is extremely complex and what we show is only an indication. The rate of which vegetable oil is broken down (decomposed) depends on amounts of oxygen/ light, metal contamination, frying temperature, level of FFA in fresh oil, total oil volume etc.,” Wadsten explains. He offers as an example the breakdown rate of vegetable oil, which doubles for every ten-degree

oil temperature increase, above 160C. If a very small piece of brass or copper is put in the fryer, the oil will break down very quickly.

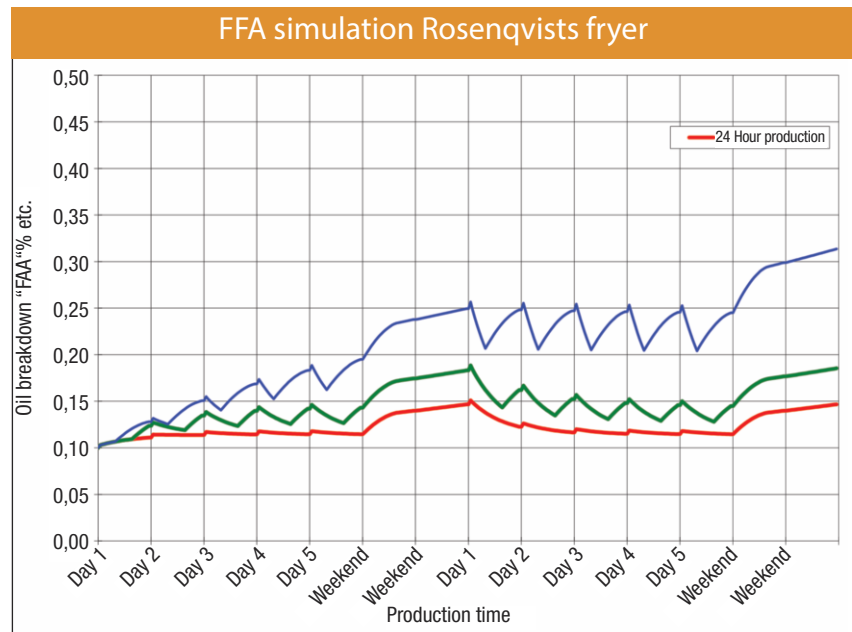
Rosenqvists’ simulation program accounts for the above and other external factors impacting the breakdown of the vegetable oil. Oil quality and continuous production over long times are important when selecting a new batch fryer, according to Rosenqvists. As the slices are not washed, the debris quickly is collected inside the pan causing frequent fryer stops for cleaning. The internal oil flow system and continuous oil filtration system of the batch fryer ensures that all debris is collected outside the fryer pan. When the fryer is emptied after the fried batch - the Rosenqvists equipment has a unique system that ensures that every fried chip is leaving the fryer, before the next frying cycle starts. The fryer is heated by an external thermal oil heating system. By using this heating system, the oil is not overheated and the vegetable oil is injected into the frying pan in multiple points, with accurate precision, to match the set temperature cycle of the batch. As the oil is heated out-side the fryer pan, the pan is completely free from any piping, heat exchangers, etc. making it very easy to clean and avoids any possibilities for dirt collection inside the pan. The double agitation wagons are independently controllable over the



PLC. The criteria for every type of batch fried chips produced are stored in the recipe bank of the PLC. "The new and unique features with our batch fryer are: no piping or heat exchangers inside the fryer pan, no gas – thermo oil heating only, adjustable temperature profile along the frying cycle, extended production time without cleaning stops, clean design of frying pan, scraper system for frying pan bottom and sides, continuous oil filtration, guaranteed empty pan – after each batch, short discharge time after frying cycle, extremely short heat recovering time," explains Wadsten.

EQUIPPING LINES WITH CIP SYSTEMS

As all the modern processing equipment, modern processing lines are equipped with a CIP system, which allows for thorough cleaning of the line. An example of a unique feature



comes from the Dutch equipment manufacturer Kuipers', whose plants represent the main support frame. This is used for the installation of all machines of the

complete processing line. The design of these support frames allows for internal, hidden installation of electric cables, and pneumatic tubing. This gives the

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- Unique batter applicator



plant a clean design, which further facilitates easier cleaning and maintenance. Furthermore, most of the company's lines include an external heat exchanger, the use of which automatically makes the cleaning of the equipment more effortless, as the shell and tube structure is placed outside the fryer. This is a great advantage, according to Kuipers Marketing Manager Valeria Lucinschi, since the oil carries particles of product that sometimes remain on its base. In cases where electrical elements are used, the coils are placed in the lower part of the fryer thus can become burned and accelerate the oil degradation process.

"Within a potato processing plant, the frying equipment is, if not the most, one of the most expensive units. In fact, small scale producers may operate many stages manually to save costs, however, the fryer is the essential element. The financial investment in the frying technology depends on aspects such as capacity, type of product to be processed as well as the heating system used. Some fryer designs may be slightly more expensive depending on the additional provisions they require to fry a product. Retrofitting is in some cases a very complex process which requires a lot of engineering hours. Kuipers can, however, upgrade some of our own existing lines depending on the state of the machinery. We do not retrofit other manufacturers' lines as our philosophy differs from other machine builders and will impact the overall quality of the end product," explains Henk van den Bovenkamp, sales director with Kuipers.

The company's representatives also say that the end product's characteristics and general operation conditions should be the primary criteria when choosing a fryer design. Each product has its own unique attributes, which should be carefully evaluated before selecting the equipment. For example, at Kuipers the standard fryers are segmented in various types, according to the product to be processed. For 'sinking products'

"Kuipers uses multi-flow injection points to insert hot frying oil at different locations within the fryer. The injection points begin at the inlet of the fryer and are divided according to the overall length, as well as per thermodynamic heat transfer requirement, or temperature profile needed by this specific line."

Henk van den Bovenkamp, Kuipers



such as peanuts or fries, the design of the fryer is different than for the 'floating products' such as chips or corn nuts. Product buoyancy, texture, frying time are some examples of the key attributes. It is also important to note that various products may change attributes during frying. One example of this case are the coated nuts, which are initially a 'sinking product' but change buoyancy characteristics during frying. This means a new type of fryer design is necessary to cope with the 'sinking' and 'floating' attributes of the product simultaneously. Moreover, fryer capacity should also be considered. It is important to have the right ratio of oil to food quantity within the fryer at all times. Therefore, a careful analysis of how much a manufacturer wishes to produce should be performed before deciding on capacity.

ONE LAST CONSIDERATION

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. In addition, food manufacturing is also subject to an increasing number of regulatory policies, including the limitation of contaminants in water, as well as greenhouse gas emissions. With rapidly increasing energy prices, however, keeping energy costs low is essential when trying to achieve a more efficient and sustainable production process. Therefore, by partnering with a leading processing solutions supplier, such as tna, for example, manufacturers can get the advice they need to meet increasing consumer demand or changing regulatory requirements – from controlling energy costs, to minimizing waste, controlling fryer pollution, reducing water usage or improving heat recovery, a team of experts can provide recommendations that are specific to individual production needs. ●



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Making the Most of a Main Ingredient

The fryer system should have an effective filtration system, to remove the particulate material from the fryer. The product attribute may dictate what type of filtration system(s) are required which could include cartridge filters through to continuous belt types.

By Dan Orehov

While frying any product, the preservation of a high frying oil quality is essential. The frying oil is not only the heat transfer source which cooks the raw input but is also absorbed by the actual product. This subsequently contributes to the taste as well as color and texture of the crisps. Good filtration is one of the key factors when considering preservation of oil quality. While filtration systems vary for different products, it is important to begin the process before frying, especially when it comes to chips.

SAVING OIL

Frying systems are generally quiet energy intensive. With new regulations, as well as increased pressure from the public, many companies are forced to take measures to mitigate emissions. While processing potato chips, around 80% of the total energy required is absorbed by the frying system. Therefore, if the necessity to reduce the total energy arises, this is the area to begin with. "At Kuipers we use a combination of procedures to achieve this optimal energy requirement. By implementing multiple injection

points in our fryer, we ensure efficient and exact heat transfer necessary for the crisp without fluctuations or extra usage. This, in return, allows us to use the minimum oil content required since the optimal heat is achieved over the whole length of the fryer," explains Henk van den Bovenkamp, sales director with Kuipers. "In addition, the screening of the product before frying eliminates small particles and defect pieces of the product. This means there is less or no filtration required within the fryer. Because these small particles are not

entering the frying system to deteriorate oil quality, less energy is required to fry," he adds. Another important process the company's potato processing technology includes is blanching, a process that reduces the moisture content within the product, eliminates soluble solids, such as sugars, and removes air from the tissue. The potato's properties are then optimal for efficient frying. This reduces the overall energy while maintaining good taste, color and texture without the use of any chemicals. Finally, the Kuipers' fryers are equipped with protecting gladding which also acts as an isolator. The fryer hood and blancher can also be built with isolation. It is important to note that some companies also use electricity instead of thermal heating systems, however this mostly happens in small processing lines.

Moreover, the most common used oil in frying potato products is vegetable oil, while many areas utilize sunflower oil, even though, in theory, any oil can be used to fry crisps/chips or fries.

VARIOUS FILTERS

The potato needs to be well prepared before entering the frying stage, as this will contribute to oil quality preservation, while helping the filtration system integrated within the fryer. Many types of filters may be implemented depending on the product, for example paper filters are more suitable for peanut frying, which require finer dust particle screening, while other filters can have bigger openings and will operate just as efficiently. For potato chips and fries, the dirt catch box is the most economical and efficient solution. This filtration system is ideal for larger particles

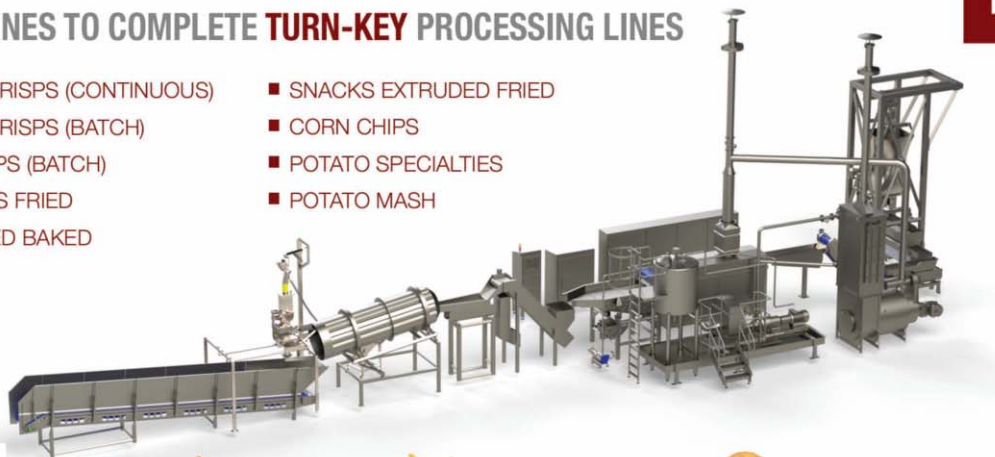
filtration. It consists of a special belt filter with moveable flights which is installed in the discharge piping of the frying system. With regards to turnover rate and the general lifetime of frying oils, Kuipers specialists say that for French fries, oil turn over in a fryer is about 10 hours on average, while the maximum time to use the same oil in the fryer is 20 hours, when oil pick up is not sufficient. "Oil turnover is one of the most important factors to consider while evaluating frying technology. The lower this figure is the better as it allows continuous operation for a longer period. A high ratio of fresh oil to total oil provides better frying oil quality overtime. Naturally, the lower the turnover figure is the more frequent the replacement of oil happens. Frequent replacement of fresh oil decreases the chances of FFA formation and increases frying life and quality of oil. Most of

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Photo: Kuipers

“The screening of the product before frying eliminates small particles and defect pieces of the product. This means there is less or no filtration required within the fryer and thus less energy is required to fry.”

*Henk van den Bovenkamp,
Kuipers*

continuous production lines will have 5 to 12-hour turnover. Kuipers, however, guarantees a 3-hour turnover time for many products, sometimes even less like in the case of pellet processing. This is why our production lines save our customers thousands on oil, cleaning and maintenance as well as staff costs every year,” van den Bovenkamp details.

ADVANTAGES OF USING A DEFATTER SYSTEM

The appeal of crisp potato chips and countless other fried snack products is constantly growing. At the same time, consumers are showing clear, strong tendencies to favor low fat snacks- i.e. healthier products. The original fat-stripping unit, first invented and developed over 20 years ago, reduces the fat content of chips and pellet-based snacks from the normal 34-36% down to 24-26%. In absolute terms, this means a 10% fat reduction. The basic principle for this equipment’s functionality implies that the defatter has to be connected directly to the existing fryer, in order to achieve the best result and have no negative impact of the oil quality. In turn, this provides further benefits, as companies can not only produce snacks with a lower fat

content, but also re-utilize the oil for further processing. According to Swedish company Rosenqvists, a defatter lowers fat content by some 10% and the stripped fat is reusable, thus creating major savings. Moreover, the defatter is designed to operate very easily, while at the same time being robust and constructed from

stainless-steel. This way, it is also easy to clean and provides good access for maintenance, thus being compliant with a Clean-in-Place system. Last but not least, since it is one of the best equipment of its kind on the market, the defatter is versatile enough to be suited for potato chips, tortilla chips, and extruded or pellet-based snacks.



Photo: Rosenqvists

“The Defatter works as an inline closed chamber and follows a set of simple procedures:

- Steam is injected and blown through a heat exchanger where it is superheated to 300-320 °F
- The superheated steam passes the product bed, picking up excess fat from the product surface
- The fat-laden steam passes through a special filter which removes and recovers the fat
- Since the process takes place in an oxygen-free environment, the quality of the fat is preserved and it can be pumped back to the fryer.

Looking at the above advantages of such an equipment, one can clearly see the benefits associated with its installation into a potato processing line. By subtracting fat, a company adds value to its products. Thanks to its efficient, economic performance, the defatter also adds value to the production line.

Rosenqvists offers complete, top-performance production lines for chips, French fries and pellets, since at the core of each of our frying lines there is another innovation- the Multi-Flow 1M Fryer which uses less oil than conventional fryers, and fries at uniform, tightly controlled temperatures, thus giving low, constant FFA values. When the Multi-Flow Fryer and Defatter are combined into a processing line, the product quality and economy is substantial,” explains Göran Wadsten, sales manager, Rosenqvists Food Technologies AB.

To conclude, experts say that sometimes manufacturers handle the problems with complicated filtration systems, while not achieving the result and failing to prevent oil degradation. This subsequently means a stop in production for cleaning, which can last hours and requires at least two staff members. That is why it is important to take into consideration the functionality and operation of the line as a whole. While choosing an oil filtration system, the type of product is without doubt key. A set of questions should be answered, such as: what is the size of this product? what is the type of potato to be used? what are the characteristics of the product? how long do I intend to fry the product? what slicing/dicing method is to be used? The overall processes matter and must be carefully evaluated before the filtration method is chosen. •

“By subtracting fat, a company adds value to its products. Thanks to its efficient, economic performance, the defatter also adds value to the production line.”

Göran Wadsten, Rosenqvists



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Kevin Hill

Robin Ostermeier

Pulsed Electric Fields (PEF) Processing for Chips

The use of PEF or Pulsed Electric Fields in the snacks industry has received a lot of attention. The technique is based on electroporation, a physical principle which applies short electrical pulses of high voltage, to induce pores in cell membranes, with no adverse effects to the product itself.

By Kevin Hill & Robin Ostermeier, R&D Engineer and Snack experts at Elea

All cells are surrounded by a membrane, mainly consisting of phospholipids, which makes the membrane to be considered as a non-conductor with a naturally occurring transmembrane voltage. Applying an external voltage results in a charge accumulation at the membrane and an increase in the potential is induced. This triggers an electrical compression of the cell membrane and results in a pore formation. Plant cells, e.g. potato cells, lose their internal cell pressure (turgor) when subjected to the PEF treatment. In recent years, the importance PEF in the white potato chips industry has increased. By reducing the starch loss after cutting and therefore increasing the yield, as

well as decreasing the oil uptake during frying, PEF is able to increase revenue for potato chips. Furthermore, it improves the overall quality of potato chips by allowing more gentle frying conditions, leading to chips that are lighter in color, have lower fat content and an improved crunchiness. In the past years, a new market has developed all over the world in form of vegetable chips. Since 2017 the yearly revenue of non-potato chips has increased steadily and a further growth for the upcoming years is projected. Vegetable chips are usually produced in a kettle style, where the chips are fried in batches at usually lower inlet temperatures of around 145 °C. A typical batch frying curve is u-shaped with a temperature drop of around 10-20°C

and a final temperature that is close to the initial temperature. That leads to a harder, more crunchy texture compared to continuously processed chips. However, vegetable chips pose some challenges during processing. Unlike white potato, the raw material for vegetable is less standardized in regards to sugar and solid contents. Furthermore, the amount of reducing sugars in the raw material is generally higher in vegetables compared to white potato. As the slices are usually not washed or blanched prior entering the fryer, there is no way to lower the reducing sugar content in the raw material, which can lead to high levels of acrylamide, resulting in burned vegetable chips, commonly found on the market. Here PEF can

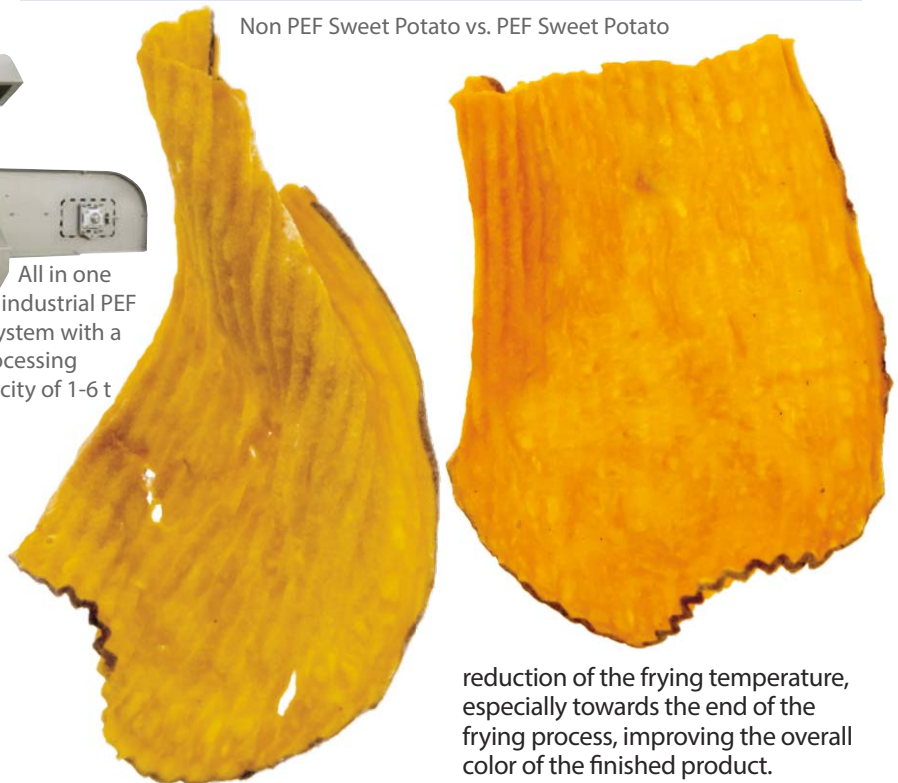
help by enabling frying at lower frying temperatures due to a facilitated water transfer rate.

BENEFITS OF PEF

The electroporated membrane induces a water leakage out of the cells, reducing the turgor pressure inside the cell, resulting in an overall softer, and easier to cut raw material. This allows an easier processing of

“The use of PEF has started to transform snacks industry. The potential to use a broader range of raw materials will open further application fields and product development options.”

Non PEF Sweet Potato vs. PEF Sweet Potato



All in one industrial PEF system with a processing capacity of 1-6 t



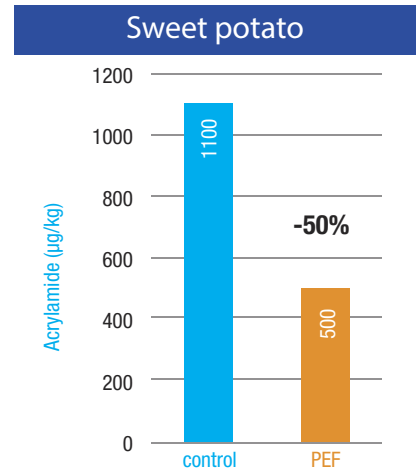
hard raw material like cassava, taro or sweet potato. The softening enables the use of new raw materials and also more complicated cuts, such as deep rich or waffle cuts are possible. As the raw material is softer, it results in a smoother cutting surface and less wear of the cutting knives, reducing the amount of times the knives have to be changed. Furthermore, as less cells are mechanically damaged through the knives, the number of fines, debris and starch that occurs is reduced during cutting. On the one hand, this reduces the amount of chips sticking together during frying, on the other hand it leads to an increase in yield. In addition to that, the smooth surface area further reduces the oil content of the final product, as the drainage from the product, after it is removed from the fryer, is improved, leading to a fat reduction by up to 10 %. For batch frying the slices directly enter the fryer after cutting with no washing step to remove surface starch and reducing sugars. Therefore, it is very important to control the frying conditions in order to keep acrylamide levels of vegetable chips as low as possible. Due to the PEF-induced open cell structure water leaks out from the

slices during processing. This increased amount of water on the chips surface and leads to the formation of a vapor layer on the surface of the chip during frying, reducing the amount of chips sticking together in the fryer. As a result, less rejects can be observed. After frying an overall crunchier texture can be detected for PEF treated chips, as the open cell structure allows for a more uniform gelatinization of the starch kernels. Due to the facilitated water diffusion rate, an increase in batch size of the fryer is possible. In average an increase in batch size by around 5% and a reduction in frying time by 10% can be achieved. This results in an overall capacity increase of approximately 15%. Furthermore, it is easier to evaporate water from the chips during frying, allowing a

reduction of the frying temperature, especially towards the end of the frying process, improving the overall color of the finished product. In addition to that, a reduction in frying temperature at the end of the frying process helps to control the acrylamide levels in the vegetable chip. Acrylamide is a chemical compound that has been classified as probable human carcinogen by the International Agency for Research on Cancer. It is formed during the Maillard reaction as asparagine reacts with reducing sugars at temperatures above 120 °C. Therefore, it is a relevant problem in the chips processing industry. In April 2018, the European Union passed the commission regulation on the reduction of acrylamide. According to this, the levels of acrylamide have to be kept as low as reasonably achievable (ALARA). Due to the reduced frying temperatures enabled by PEF significant reductions in acrylamide levels of the final product can be achieved.



can be saved per year. This amounts to an increase in revenue of EUR188,000 per year from saved solids alone. Furthermore, the yearly oil consumption is reduced (-174 t). These oil savings are equivalent to save 178 football field sized rape seed fields. The extra production capacity of 67 t is comparable to supply all football supporters in Camp Nou stadium (Barcelona) for 27 matches with 25 g chips bags. Installations of more than 100



performance. A new processing line with optimized processing will result in less cost savings than a comparable older processing line. The increase in yield and a reduced oil uptake typically are the major contributors to commercial benefits observed.

CONCLUSIONS AND OUTLOOK

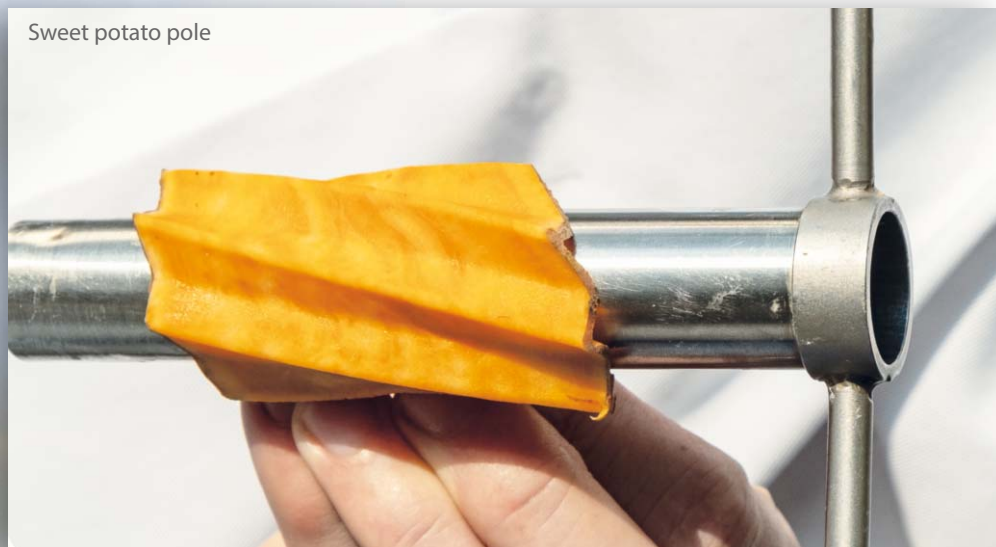
The use of PEF has started to transform snacks industry. The

Depending on the reducing sugar content of the raw material, levels of reduction in acrylamide from 30 % for beetroot (1000 ppm to 700 ppm) to 50 % for sweet potato (1100 ppm to 500 ppm) could be observed in the past.

machines in the potato sector have shown, that a ROI periods range from three months to up to two years in most situations. Of course, the savings are also related to product characteristics, raw material quality and the overall line

RETURN ON INVESTMENT

Naturally, the implementation of PEF is associated with additional costs. When processing about 24000 t raw material annually, the costs for a 6 t/h PEF system would amount to about 6 EUR/t raw material with a depreciation of 3 years. Taking electricity consumption and other running costs into consideration, the overall costs would be about 7 EUR/t raw material (Elea GmbH 2018). However, processing and quality benefits like 10% less starch leakage, reduction of doubles by 4% and a reduction of oil uptake by up to 15% contribute to a relatively short ROI. On a vegetable chips line of 1.3 t/h finished product, a total of 47 t solids



“The electroporated membrane induces a water leakage out of the cells, reducing the turgor pressure inside the cell, resulting in an overall softer, and easier to cut raw material.”

potential to use a broader range of raw materials and increase product yield and quality will open further application fields and product development options. The technique is easy to integrate into existing batch and continuous processing lines and is well scalable from pilot scale testing to industrial production. •



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Frying Technology: Focusing on Efficiency and Safety



In these unprecedented COVID-19 times, manufacturers of potato products are experiencing opposite demands for their products. While lock-down situations mean meal-preparation is mostly home-based and snacking on a whole is at a rise, for suppliers to the foodservice and hospitality industries the closure of restaurants and cafes are negatively impacting demand.

By Don Giles, Processing Systems Heat and Control, Inc.

While statistical data is not yet available to explain the full impact, or even to determine future implications to these industries, there is an expectation that life will eventually return to normal. In the short-term, temporary plant closures or budget-holds may impact equipment manufacturers, but the industry should see a return to “business as usual”.

DEVELOPING COUNTRIES EXPECTED TO DRIVE THE MARKET

One of the most popular snack

foods, the global potato chips market was approximately USD30bn in 2019, and experts had projected stable growth during the first part of the decade. The French fry market reached a value of USD20.4bn in 2018. As of the time of the writing of this article, no information was available that incorporated the impact of COVID-19 on these projections. While Western countries have historically consumed a majority of potato chips and French fries, developing countries are expected to drive the global market in the coming years due to the emerging trend of westernization of food consumption patterns,

growing economies, increasing middle class populations, and expanding urbanization. In our 70 years Heat and Control’s driving commitment is to ensure our customers’ operations become more efficient through increasing production speeds without compromising quality and safety, reducing waste and downtime. Being a single source supplier of equipment allows for the provision of holistic solutions designed and manufactured specifically to meet the requirements of each individual customer. This continuous improvement philosophy applies to fryers, ancillary oil management

systems and the line as a whole. Both the potato chip and French fry industries have grown at an exceptionally high rate and have specialized requirements for output capacity, uptime efficiency, fuel efficiency, and equipment reliability. With respect to output capacities both industries have continued to increase. In response to this demand equipment manufacturers such as Heat and Control have developed fryers to meet this requirement. That is supplying potato chip fryers with a finished chip output capacity of up to 6,000 lbs./hr. (2722 kg./hr.) and French fry fryer systems with a finished product capacity of up to 60,000 lbs./hr. (27,215 kg/hr.). Handling such high rates of output capacity

margin, each point of fuel efficiency of a heat exchanging system can make a significant difference between being price competitive in the marketplace or not.

PRODUCT QUALITY HAS THE HIGHEST INFLUENCE ON PURCHASING DECISIONS

There are many factors to consider when determining the best fryer design for a customer's application. Ultimately product quality will have the highest influence on the decision, however it is also important to consider floor space, production capacity, acquisition price, and the method of heating cooking oil. Working with a manufacturer with experience in custom-designing fryers for each

Batter Fry system capabilities give processors many options. Every machine is custom manufactured according to a processor's specific requirements, priorities, and location to maximize productivity - from a single machine to several integrated components to a complete system and assume single-source responsibility. Including pre- and post-sale technical support, applications assistance, engineering, installation, parts, service, and training to maintain peak efficiency. Heat and Control offers a variety of frying systems including:

- Batch Fryers
- Continuous Fryers
- Multi-Zone Fryers
- Multi-stage Fryers



requires that systems be very robust and reliable, and uptime efficiency is a key measure of equipment dependability. Even one hour of downtime can mean lost revenue and dissatisfied customers if orders cannot be filled. Since potatoes are very high in moisture (roughly 80% water), the heat load required to process them into finished product is extremely high. Millions of BTU/hr. are required to evaporate the water from the potatoes. As such, the thermal efficiency of a system is very important and critical to profitability. Also, since some industries, such as the French fry industry, work on a very low profit

processor's unique requirements can assure productivity and product quality to meet expectations and lay the groundwork for future growth. Heat and Control manufactures a complete line of equipment for all frying-related requirements, including fryers, fryer support modules, heat exchangers, oil cooling modules, and water removal systems. Many models come standard with innovative features, as well as useful options. For example, the Unitized Fryer pan design eliminates expansion joints, the Fryer Support module reduces installation time by 75%, and the Combination Batter Fryer and Non-

- Thermal-Fluid Heated Batch Fryers
- Vacuum Fryers.

THE OIL FACTOR

French fries and potato chips are processed in cooking oil, which becomes an integral part of the finished product. Operators must take great care to preserve the quality of the cooking oil. They pay close attention to such areas as the oil volume in a system as it relates to cooking oil turnover rate, as well as oil filtration to continuously remove product particles from the oil to prevent oil breakdown and black specs on the finished product. Elaborate multi-stage filtration systems are very common

which may consist of initial screening to remove large product fines followed by centrifugal separation and then a paper or other type final stage filter to remove particles down to the micron range.

Cooking oil Delta T (cooking oil temperature drop through a fryer) is critical to achieving the best quality finished product. Multi-zone fryers (multiple oil inlets and outlets) are used to control the fryer Delta T. Some products, such as a batter-coated product, utilize two-stage fryers. In the first stage, they initially set the coating on the product with light fryer belt loading and then finish the fry in a second stage fryer with much heavier fryer belt loading.

High quality equipment can last a long time; however, there are reasons for companies to consider upgrading their equipment. In general, modern frying equipment has several advantages over older frying equipment, such as a more robust design, a higher efficiency heat exchanging system, and the ability to tailor the equipment to meet a customer's very specific specifications for the equipment, some of which are very rigorous. Depending on the company and their particular product and needs, the ROI can be surprisingly significant.

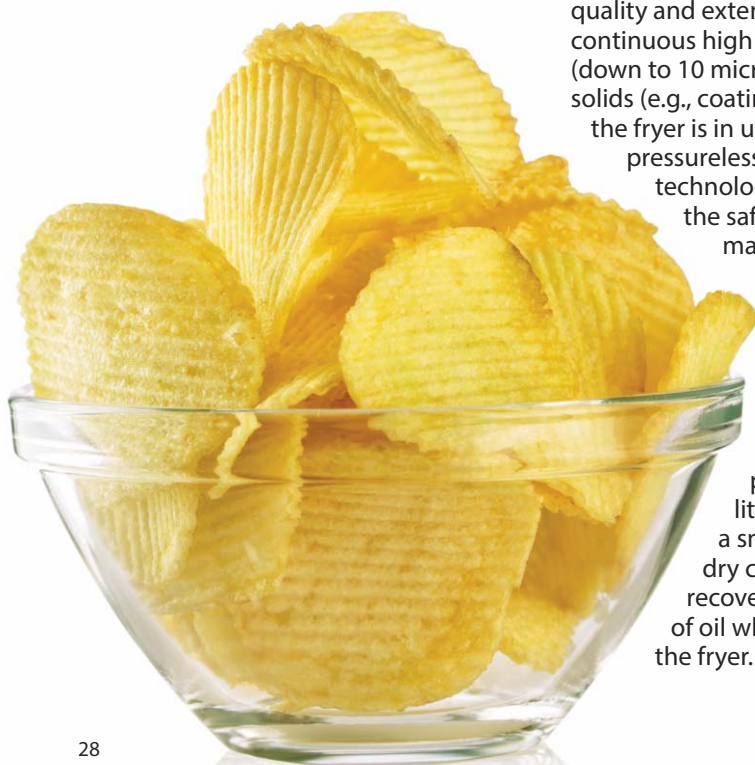


As well as being an important ingredient to the finished product, frying oil is typically an expensive part of food processing. Oil recovery during production not only reduces energy usage, but also sees higher yields through cost savings. Heat and Control recently released the OilSaver Filtration System, their newest innovation in their oil management system line-up. The OilSaver preserves frying oil quality and extends its life with continuous high efficiency filtration (down to 10 microns) and removes solids (e.g., coating, crumbs) while the fryer is in use. The

pressureless OilSaver's vacuum technology makes it one of the safest options on the market by eliminating spraying of dangerous, hot oil from the system. Also, the OilSaver accommodates up to 60 gallons per minute (227 liters per minute) in a small area, and the dry cake discharge recovers large quantities of oil which is returned to the fryer.

CONTINUOUS VS BATCHED FRYING

When producing potato chips, it is important to consider the distinction between continuous cooked chips and slow-cooked, hard-bite style chips. This is based on the time/temperature profile used to cook the chips. Continuously cooked chips, at higher temperatures and shorter cook time, result in a softer texture and a higher oil content chip. The low temperature longer cooking time of chips results in a crunchier, "harder bite" chip with a lower finished chip oil content. Although continuous cooked chips are the mainstay of the market, the growing segment, making up about 20% on the market, is the hard-bite chips typically made on batch fryers to achieve the "U" shaped temperature profile required to develop the crunchier texture. While continuous cooked chips are produced at rates up to 6,000 lbs./hr. of finished chips from one fryer, kettle chips are produced in a batch fryer with a maximum capacity of up to 500 lbs./hr. per fryer. Kettle chip producers typically utilize as many as 10 or 20 batch fryers to produce the capacity required to meet their market demand.



Acrylamide formation during the frying process is a growing concern for many potato chip processors. Vacuum Fryers are a popular way to reduce acrylamide, as they can keep frying oil temperatures below 120 degrees Celsius, the point at which acrylamide forms. They operate at 10% or less of normal atmospheric pressure, so the moisture boils off at lower temperatures. This means it can fry products with a higher sugar content, like potatoes, without over browning finished chips.

Another way to reduce acrylamide is to pre-treat potatoes prior to the frying process by using a method called electroporation. This technique involves electrical fields being sent through a cell in order to perforate the membrane with microscopic holes. This process allows sugars and amino acids to be released from the potato prior to cooking, which in turn lessens the occurrence of acrylamide. Heat and Control's E-FLO™ has seen excellent results using the electroporation method for potato chips with a reduction in acrylamide of over 50%. The electroporation process is also beneficial to French fry manufacturers as potato strips are more permeable, with less breakage and higher yields.

WORKING IN A COVID WORLD

The COVID-19 pandemic has impacted French fries and potato chips quite differently. Potato chip producers are selling every pound of product they can produce and still are unable to keep up with demand. On the other hand, French fry producers have seen a very large drop in sales primarily because of the closure of restaurants, food service, and schools that represent a major percentage of sales for many processors. Unfortunately, these large French fry producers are not able to enter the retail market because they do not have the equipment or processes in place from either a package-size consideration or a channel-of-distribution consideration.

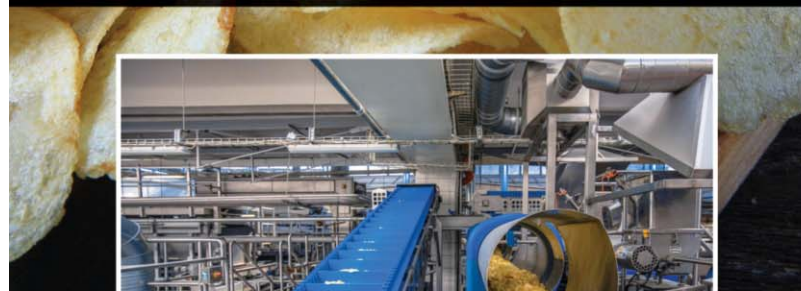
As the COVID-19 pandemic subsides, snack foods are expected to gradually resume a more moderate rate of growth and French fries will gradually regain sales to more traditional levels. Both snack foods and French fries will likely continue being consumer favorites, and potato processors look forward to helping their customers meet consumer demand for improved quality and increased variety.

As for the sales of food processing systems, the COVID-19 pandemic has put caution in the minds of food processors, many of whom have put a hold on planned projects. Access into food processing facilities has been greatly restricted as processors try to care for the well-being of their employees and to avoid plant closures and the loss of their ability to manufacture and to distribute their products. Likewise, Heat and Control has implemented new protocols to maintain their employees' safety.

Heat and Control's customer support, spare parts organizations, and field service technicians remain fully functioning during the COVID-19 pandemic and are committed to continuing to provide customers with the ability to achieve their production goals. •



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The Fight Is Not Over

Acrylamide is a carcinogenic substance that is formed in foods that have undergone heat treatment, e.g. roasting, baking and frying, and that are high in certain amino acids and reducing sugars. It is therefore an issue in French fries and potato crisps, but also in other foodstuff such as biscuits, coffee etc. This article explores the various viewpoints of scientists and authorities from both Europe and the United States.

By Dan Orehov

With new scientific information becoming available on acrylamide, the European Food

Safety Authority posits that the acrylamide (AA) MB levels in 'Potato fried products (except potato crisps and snacks)' were on average at 308 µg/kg and at the 95th percentile at 971 µg/kg. The lowest levels were observed in the group of 'French fries and potato fried, fresh or pre-cooked, sold as fresh or pre-cooked and prepared as consumed' (MB average at 239 µg/kg) and the highest levels in the group of 'Other potato fried products' (MB average at 606 µg/kg) which gathers rösti, kartoffelpuffer and pancake.

However, such observations may be biased by some misclassifications. In some cases, the information on the condition of preparation of the French fries before analysis was collected separately from the transmission of the individual results. Moreover, the food classification used for the data

collection only distinguishes the French fries sold as ready to eat taken in small outlets, fast food chains and restaurants, from the pre-cooked French fries/potato products for home cooking. This led to some difficulties to handle the fresh/pre-cooked French fries/potato products sampled in restaurants before cooking and analyzed as such, or prepared under laboratory conditions and the fresh/pre-cooked French fries/potato products taken as ready-to-eat at home. Higher AA levels were observed in 'Potato fried products (except potato crisps and snacks)' made from fresh potatoes (MB average at 275 µg/kg) than in 'Potato fried products (except potato crisps and snacks)' made from potato dough (MB average at 197 µg/kg), but no substantial difference was observed between 'French fries' baked in the oven (MB average at 257 µg/kg) and those deep fried (MB average at 243 µg/kg). Insufficient information was available at the sample level to compare the

levels of AA in French fries according to their size, the conditions of frying, whether the pre-cooked product was frozen or not, and the storage conditions of the potatoes.

On the other hand, The AA MB levels in 'Potato crisps and snacks' were on average at 389 µg/kg and at the 95th percentile at 932 µg/kg. AA was found in higher levels in 'Potato crisps from fresh potatoes' (MB average at 392 µg/kg) than in 'Potato crisps from potato dough' (MB average at 338 µg/kg). AA levels appeared to be lower in potato crisps from batch process (MB average at 327 µg/kg) than in potato crisps from continuous process (MB average at 387 µg/kg). However, such observations may be biased by the differences in the number of samples between the different categories of 'Potato crisps and snacks'. Lower levels were observed in 'Potato snacks other than potato crisps', including mostly puffed potato snacks (MB average at 283 µg/kg) than in the 'Potato crisps'

USDA RECOMMENDATIONS

In one of its latest guidance on acrylamide, the Food and Drug Administration (FDA) in the US suggests a range of possible approaches to acrylamide reduction. Factors affecting acrylamide formation are present at various stages from farm to table, so this guidance is for growers, manufacturers, and foodservice operators.

However, FDA is not suggesting maximum recommended levels for acrylamide in various products at this time. Instead, they recommend that manufacturers be aware of acrylamide levels in their products, because knowledge of acrylamide levels is essential for determining the effectiveness of acrylamide reduction techniques. The predominant analytical methods for acrylamide determination are liquid chromatography/tandem mass spectrometry (LC/MS-MS) and gas chromatography/mass spectrometry (GC/MS). In potatoes, reducing sugars are present in excess compared with asparagine, and reducing sugar levels are the important factors driving acrylamide formation. Careful control of reducing sugar levels can reduce acrylamide formation in finished potato products such as French fries and potato chips. Among the factors that affect reducing sugar levels are potato variety, growing and harvesting practices, maturity, handling, and storage conditions (including temperature and control of sprouting).

French fry and potato chip producers have traditionally selected potatoes that are low in reducing sugars to minimize browning. Chipping potatoes (for potato chips) typically have the lowest sugar levels, followed by potatoes for French fry processing, and fresh market potatoes. Selecting potato varieties that are as low as possible in reducing sugars may help reduce acrylamide, while still retaining desirable product qualities. Some members of the Snack Foods Association (SFA) recommend against using Russet varieties for producing potato chips because of high reducing sugar levels.

Typically, manufacturers use different potato varieties throughout the year, depending on whether the potatoes

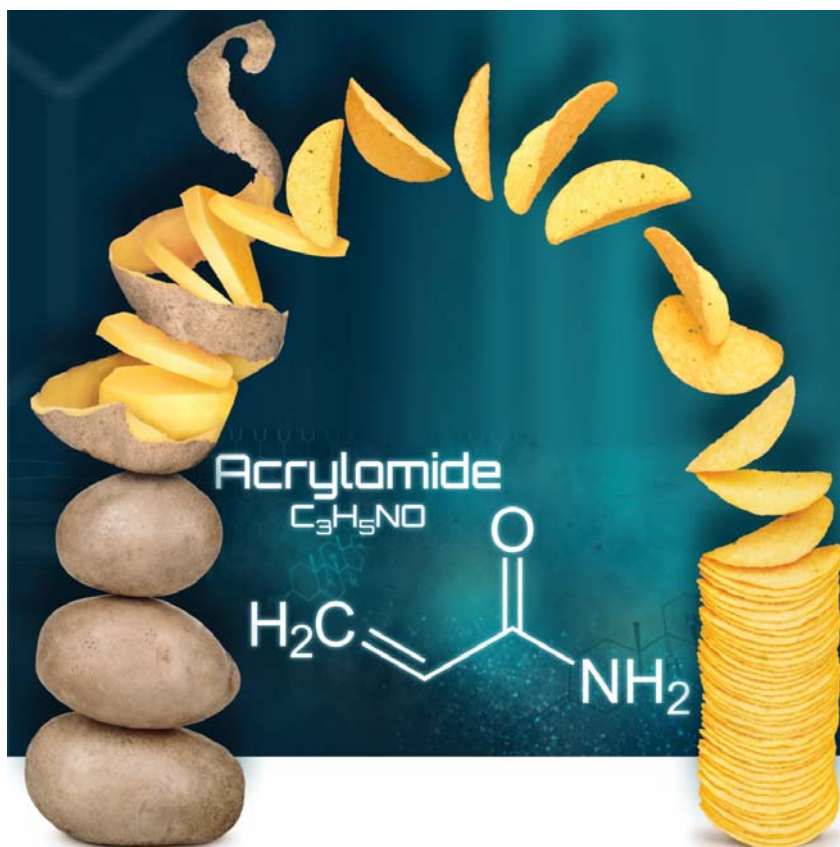
are coming from fresh crops or from storage. The most suitable variety may vary by region and by season. Large manufacturers may be able to specify suitable varieties or grow their own varieties through contracts. Smaller manufacturers may be able to consult with local extension services to identify low-reducing-sugar potato varieties available in their region at different times of the year, or request their suppliers to provide low-reducing-sugar varieties, when possible. New potato varieties with lower reducing sugar content and greater resistance to cold-induced sweetening are in development, as are cultivars with lower levels of asparagine. Both conventional breeding (e.g., crossing commercial potato varieties with wild varieties) and biotechnology have shown promise in reducing acrylamide levels. Six new bioengineered potato varieties with lower asparagine and/or reducing sugar levels and lower acrylamide formation potential have completed FDA's final biotechnology consultation process. Development and commercialization of new potato varieties is a lengthy process, but may ultimately provide the most effective solution for acrylamide reduction. As new potato varieties come on the market, experts

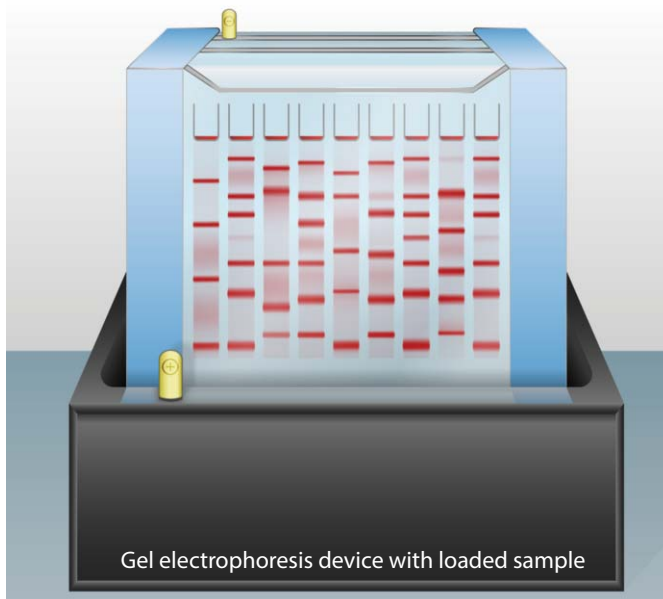
advise to consider adopting varieties that offer the potential to reduce acrylamide levels.

In the U.S., French fries supplied to foodservice establishments and packaged for direct sale to consumers are typically frozen, par-fried French fries. A standard production process for frozen, par-fried French fries consists of peeling, washing, sorting for size and defects, cutting or slicing, blanching, dipping or coating (e.g., in a dextrose solution), drying, and par-frying. The par-fried products are intended to be cooked to completion in a food-service establishment or in the consumer's home. Levels of acrylamide are low in the par-fried fries, but increase significantly in the final cooked product. Final cooking conditions are the major factor in determining final acrylamide levels, but changes in processing by frozen French fry manufacturers can also affect acrylamide levels in the final product.

UK'S FSA APPROACH

The Food Standards Agency in the UK says that laboratory tests show that acrylamide in the diet causes cancer in animals. Scientists agree that acrylamide in food has the potential to cause cancer in humans as well. Therefore, the recommendation is that levels of acrylamide need to be





reduced in foods, as a precaution. It goes on to say that the food industry has undertaken a lot of work to identify and implement measures to reduce acrylamide levels in food. This includes developing guidance on ways to limit acrylamide formation in a variety of foods and processes. New legislation will require food business operators to put in place simple, practical steps to manage acrylamide within their food safety management systems.

All food businesses operators (FBOs) are required to put in place these measures, in order to make sure that they comply with the new legislation and ensure that acrylamide levels are as low as reasonably achievable in their food. Regulation 2017/2158 establishes best practice, mitigation measures and benchmark levels for the reduction of the presence of acrylamide in food. Businesses are expected to do the following:

- Be aware of acrylamide as a food safety hazard and have a general understanding of how acrylamide is formed in the food they produce;
- Take the necessary steps to mitigate acrylamide formation in the food they produce - adopting the relevant measures as part of their food safety management procedures;
- Undertake representative sampling and analysis where appropriate, to monitor the levels of acrylamide in their products as part of their assessment of the mitigation measures;

- Keep appropriate records of the mitigation measures undertaken, together with sampling plans and results of any testing.

The measures are proportionate to the nature and size of the business, to ensure that small and micro-businesses are not burdened. The legislation applies to all FBOs that produce or place on the market several types of foodstuffs, including French fries, other cut (deep fried) products and sliced potato crisps from fresh potatoes, potato crisps/chips, snacks, crackers and other potato products from potato dough. FSA also says that different requirements apply to local and independent FBOs selling food directly to the consumer or directly into local retail. For example, independent cafes, fish and chip shops and restaurants. For larger centrally controlled and supplied chains with standardized menus and operating procedures the legislation reflects that the controls of acrylamide can be managed from the center. This would apply to for example, large restaurants, hotels and café chains.

KERRY'S PRODUCT RECEIVES ORGANIC STATUS IN EUROPE

Kerry, the Taste & Nutrition company, is pleased to announced recently that its Acryleast™ acrylamide-reducing yeast has received "organic suitable" status in the European Union. This status positions Acryleast as the only organic-suitable acrylamide-reducing processing aid available in either the EU or the US, allowing it to be used as an ingredient in the production of

organic foods such as children's biscuits, baked goods, crackers, bread and others. Acryleast, which was launched in 2019 was already considered to have "organic suitable" status in the United States as a non-GMO, clean-label yeast.

The company says that with COVID-19, consumers are changing their lifestyles more than ever, driven by concerns about their health, and they increasingly consider organic foods beneficial to their health. In France, for example, 49% of consumers agree that organic food is healthier than

FDA NONBINDING RECOMMENDATIONS FOR PROCESSING FRENCH FRIES

- Cutting fries in shapes with lower surface area to volume ratio and screening out small fragments may help reduce acrylamide.
- Changing blanching practices may help reduce acrylamide, although such changes may affect product quality.
- Using sugar dips to reduce variability may help reduce acrylamide, but using reducing sugars such as fructose in dips may increase acrylamide.
- Using alternative coloration methods may help reduce acrylamide by discouraging over-baking.
- Using SAPP may help reduce acrylamide, as may evaluating other dip or batter ingredients to determine if they contribute to acrylamide formation during frying.

non-organic. The organic market continues to see strong sales growth, with the European organic sector recording expansion of 11% - from EUR33.5bn to EUR37.3bn - from 2016 to 2017. With 17% of food and drink products launched in Europe carrying organic claims (Aug 2018-July 2019, Mintel Insights), this category needed a suitable and effective solution for acrylamide reduction.

"These are challenging times for food manufacturers as they work to adapt to the emerging demands of today's marketplace. One of these evolutions is that consumers are now more focused than ever on protecting their health and that of their children," said Mike Woulfe, VP of Enzymes at Kerry. "Acryleast enables food manufacturers - now including organic producers - to vastly reduce acrylamide levels in their products. The ability to apply a clean-label, organic suitable, non-GMO yeast solution is a significant milestone that

will be of great interest to food producers focused on acrylamide reduction strategies, in preparation for the impending update of European regulations and to meet consumer demand."

This new designation for Acryleast - "organic suitable" - comes at a time when the EU Commission and member states have agreed to soon set maximum allowable levels of acrylamide in young children's food categories (biscuits, rusks, processed cereal-based foods, etc.). The EU Commission will also begin discussions with member states on the possible setting of maximum levels for foodstuffs for other age groups as they conduct a review of existing benchmark levels. Woulfe adds: "The EU continues to both expand and tighten its ongoing regulatory control of acrylamide's presence in a wide variety of foodstuffs, especially with regard to the exposure faced by children,

where rulings on maximum allowable limits are expected shortly. The November 2019 EU announcement requires member states to monitor an expanded list of bakery and potato products beyond those previously designated." These regulatory developments occur against a backdrop of updated EU-wide regulations for organic foods and beverages (set to take effect January 1, 2021). The new law, published May 2018 (2018/848), presents a substantial challenge for food and beverage manufacturers who wish to maintain their organic claims and designations. It also means a significant enhancement in the "naturalness" of organic foods and beverages offered for sale across the EU. Acryleast's new status will enable organic producers to improve the healthfulness of their products by reducing the amount of acrylamide in children's and adult organic biscuits, rusks, crackers, breads and many other items. •

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Hoegger Puree Processing and Separating Technology Improves Quality and Yield

Modern separation and puree processing systems produce high-quality purees and excellent yields. When it is also possible, at the same time, to ensure low operating costs, reliable cleaning and straightforward operation, it is almost inevitable that the entire production becomes more economical.

For more than 30 years, Provisur has been supplying primarily the potato industry with separators for gentle separating and puree processing. These are used to produce fresh potato puree from whole potatoes. In addition, it is possible to produce specialties such as croquettes, Duchesse Potatoes, Pommes Noisette etc., or from side-products of French-fried potato production. The explanations below are based on the processing of potatoes but apply similarly to the processing of other vegetables or fruit.

THE PROCESS

Peeled or unpeeled and well-cooked potatoes are fed continuously into the separator's feed hopper. The feed container is fitted with a mixing and conveying screw, which is designed to ensure that it does not form any deposits and that the "first in – first out" principle is guaranteed. A level monitoring system ensures that the hopper is not overfilled and that the machine switches off when there is not enough product. The

speed-controlled screw conveyor moves the product very gently towards the wing pump which, based on the low rotational speed, moves the product to the separating unit with controlled pressure.

CLEAN, AIRY POTATO PUREE

The Hoegger separating head is used to puree the potatoes and precisely separate any peel particles and other hard objects, without damaging the delicate potato starch cells. Consistently good separation is ensured by continuously removing unwanted items from the separating disc, using closely-fitting knives, and discharging them via the residue output valve. The residue valve is controlled by the adjustable differential pressure between the pump pressure and the residue pressure, so that the pressure in the separating unit is maintained at a constant level. The separating unit, which is open on one side, is generously dimensioned, so that the system pressure can be kept as low as possible which, in combination with the control of throughput, knife head rotation speed and differential

pressure, has a very positive effect on the separation process and the product quality.

OPERATION OF THE UNIT

The Hoegger machine has been designed to ensure that it can be cleaned easily and reliably. The operating and maintenance costs are low, because the construction of the machine is maintenance-friendly and requires only few wear and spare parts. A high yield and the machine safety required by regulations are always ensured, thanks to the monitoring of the process parameters and modern safety devices.

The machine has a PLC control system, and an operating panel is available to program its operation to the exact recipe required. All relevant operating data are displayed on the panel and can be exchanged via Ethernet with data from the operating control system. As an option, it is possible to provide a control system for the remote servicing of the separator. When installed in fully automatic production lines, the separator is equipped with the necessary monitoring devices and interfaces.

COST EFFECTIVENESS OF THE PROCESS

The process is very cost-effective, owing to the high quality of the end product, an improved yield, low operating costs and, if applicable, the automation of the system. The quality of the end product results from the even puree processing and the gentle

“For more than 30 years, Provisur has been supplying primarily the potato industry with separators for gentle separating and puree processing. These are used to produce fresh potato puree from whole potatoes.”



Feed hopper with conveyor screw

“The process is very cost-effective, owing to the high quality of the end product, an improved yield, low operating costs and, if applicable, the automation of the system. The quality of the end product results from the even puree processing and the gentle and precise separation process.”

and precise separation process. The improved yield is due to the good separation, the precise control and the resulting consistency over long production cycles. The operating costs are comparatively low because there are few wear parts and the machine can easily be operated as an automatic system.

APPLICATION AREAS

The Hoegger PS2000 from Provisur is very suitable for the puree and separating process during the production of fresh potato puree, potato specialties or potato flakes. In addition, there are successful applications for sweet potatoes, processing fruits and vegetables. •

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Off-cuts from French-fried potato production in the feed hopper



Separating head with residue discharge



Increased yield and better quality achieved with Hoegger separation technology



Jonathan Thomas

Challenging Times

Although demand for potato flakes and associated products are declining at present, the sector should recover as the global situation improves, **reports Jonathan Thomas.**

Dehydrated potato flakes continue to represent a key food ingredient throughout the world. These are manufactured either by drum drying a thin layer of cooked and mashed potatoes, or by air-drying into granules. During this process, manufacturers may incorporate additives and ingredients to improve product attributes such as texture, color/appearance and shelf-life. Potato flakes are widely used in the worldwide food manufacturing industry, offering benefits such as water and oil retention, as well as thickening properties. According to latest trade estimates, the global market for dehydrated potato flakes was worth over USD17bn in value terms during 2019. Over the next decade, global market

value is forecast to increase by an annual average of around 7%. At present, consumption is heavily skewed towards parts of the world such as North America, Brazil and Japan and the Asia-Pacific region. In recent years, demand has been aided by the growth of the processed foods industry in many of the world's emerging economies (e.g. China and India), while potato flakes are also gaining increasing acceptance as a substitute for cornstarch to add volume to foods such as soups and sauces. One important use for dehydrated potato flakes is in the production of foods such as instant mashed potato, hash browns and potato croquettes. These are purchased by customers in sectors such as retail, foodservice and industrial throughout much of the

world. Recent activity from manufacturers has included the development of new products emphasizing the provenance of their ingredients (e.g. via the use of locally sourced potatoes) or experimenting with different formats and/or flavors. Until the effects of the coronavirus started to impact upon the global food industry in 2020, sales of these potato-based products remained strong, especially via foodservice channels. While a drop in demand is anticipated for the next 12 months or so, the market appears well placed to recover during the middle to long term.

EFFECTS OF CORONAVIRUS

It seems highly likely that demand for products such as hash browns will experience a fall in 2020 due to coronavirus and its effects. Much of

this will probably stem from the closure of many foodservice outlets during most of the second quarter, which in turn has reduced demand for many types of frozen potato products – it is chiefly for this reason that North American potato production is expected to decrease by up to 30% during 2020. In

Canada's Manitoba province, for example, manufacturers such as McCain and JR Simplot have scaled back contracts with farmers due to this drop in demand. Even when operators such as McDonalds began to re-open their outlets in May 2020, breakfast items like hash browns have generally been unavailable. On a more positive note, however, the closure of much of the foodservice industry has resulted in growth of the number of meals being eaten within the home. In the UK, for example, Kantar estimates that the number of in-home meals eaten in UK households during the lockdown period has increased by over 500 million per week. Snacking occasions account for a leading 39% of these additional meals, ahead of lunchtime (32%), dinner (23%) and breakfast (6%). Without the morning rush (caused by closed schools and people working from home), it appears that consumers are inclined to take more time to prepare bigger and more leisurely breakfasts, such as cooked varieties.

According to data from the British Frozen Food Federation (BFFF), total sales of frozen foods in the UK rose by over 28% in both value and volume terms in the four weeks ending 22nd March 2020 compared with the same

“According to a January 2020 online survey of 2,000 respondents by industry group Potatoes USA, 73% of consumers reported eating potatoes at least once a week.”

period 12 months earlier. Every sector reported growth, with value sales of frozen potato products rising by almost 6%. Kantar estimates the uplift in meal occasions featuring frozen potato products at around 16 million meal occasions while most foodservice outlets remain shut. Increased purchasing of frozen foods due to lockdown policies is also being reported in European countries such as France.

Another effect of the lockdown which potentially bodes well for future growth within the retail market is the rising demand reported for household freezers in countries such as the UK. With more people inclined to stockpile foods during the lockdown period, UK sales of freezers have experienced an increase – this, in turn, may lead to greater purchasing of frozen foods such as potato products once the crisis passes.

In the UK, the retailer John Lewis reported selling three times as many freezers as usual during March 2020, while in the space of one week, AO.com (an online-only electrical store) reported growth of more than 200% in its freezer sales. Meanwhile, Amazon has experienced higher sales of freezers within the US market – for example, the number of

freezers in Amazon Appliances' top 100 bestselling items list rose from 13 SKUs to 38 once lockdown measures were implemented. The average of price of freezers in March 2020 for the retailer shot up from USD176 to USD312.

CONSUMER TRENDS & ATTITUDES

Recent consumer data indicates that products such as mashed potato and hash browns remain popular foods amongst UK consumers. In the case of hash browns, a survey carried out by YouGov in 2017 found that 60% of consumers considered them an essential component to their ideal version of a full English breakfast, which suggests that consumption remains heavily skewed towards the early part of the day. Although this was some way below items such as bacon (89%), sausage (82%), and toast (73%), it ranked above foods like fried mushrooms (48%), grilled tomato (45%), and black pudding (35%). Meanwhile, mashed potato continues to rank as one of the most popular accompaniments to many dishes, with bangers and mash one obvious example. A YouGov survey carried out in 2019 found that 76% of UK consumers liked bangers and mash as a meal option. The corresponding

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figure was also relatively high for dishes which utilize mashed potato as a major ingredient, e.g. cottage pie (76%) and shepherd's pie (75%).

Separate data from The Great British Sausage Report (which was based on a poll of 1,000 adults) indicates that mashed potato ranks as the leading accompaniment to sausages amongst the UK population, way ahead of chips.

Recent consumer data has also identified some unusual occasions during which mashed potato is eaten. Towards the end of 2019, an opinion poll conducted by YouGov on behalf of potato producer Branston found that 75% of people based in the North-East of England eat mashed potato regularly as part of their Christmas dinner. This appears to contradict conventional behavior, whereby roasted or boiled potatoes (or both) are usually the favored option.

Eating mashed potato as part of a Christmas dinner appears to be a habit more deeply ingrained in the UK's more northern and central regions. Besides the North-East, the percentage of respondents which claimed to do this was highest in regions such as Scotland (53%), Yorkshire/Humberside (58%), the West Midlands (59%) and the East Midlands (54%). At the other end of the scale, just 20% of people based in the South-East regularly include mashed potato in their Christmas dinner, a figure which rises to 25%

for Londoners and 30% in the South-West.

Mashed potato is also an overwhelmingly popular meal accompaniment or side dish amongst consumers in the US. According to a January 2020 online survey of 2,000 respondents by industry group Potatoes USA, 73% of consumers reported eating potatoes at least once a week, while potatoes continue to represent the most popular side dish in US foodservice establishments. Mashed was the most common method of eating potatoes during a typical week, ahead of baked, French fries, roasted and hash browns. Meanwhile, a survey carried out by Bob Evans Farms of Ohio in 2018 found that 67% of the US population serves or eats mashed potato at least once a month.

MANUFACTURERS & NPĐ

Potato flakes are primarily sold to customers in the industrial sector, for use in the manufacture of processed foods. In the case of mashed potato and hash browns, sales are heavily skewed towards foodservice channels such as restaurants and pubs, especially given the rising popularity of eating breakfast via out-of-home outlets in recent years. However, a sizeable retail market exists for these types of potato products in countries such as the US and the UK. Industry supply tends to be dominated by the world's leading potato producers. Many of these companies emphasize

the provenance of their potatoes – for example, the key producer states of Oregon and Idaho feature strongly within the US market.

Lamb Weston is one of the world's leading producers of dehydrated potato flakes, with an annual output of more than 30,000 tons. These are used as a base in the manufacture of foods such as mashed potatoes, potato croquettes, instant soups, gnocchi and bread mixes. Its flakes appear in varieties such as milled, regular, yellow and real taste. The company also competes in the market for hash browns – its range includes shredded, thin and shredded thick as well as regular varieties and Hash Brown Patties. Furthermore, Lamb Weston extended its range towards the end of 2019 with new Waffled Hash Browns, which resembled Belgian-style waffles. Targeted at the foodservice industry, these are marketed as a sandwich carrier, an appetizer or a breakfast item. Elsewhere in the world, Lamb Weston/Meijer services the EMEA region. From its headquarters in the Netherlands, it manufactures frozen potato products and dehydrated potato flakes for customers in the foodservice, retail and industrial sectors. During 2019, the company announced it was to construct a new EUR50m dehydrated potato business at its Kruijningen site in the Netherlands. Its foodservice range includes mashed potato, hash



“It seems highly likely that demand for products such as hash browns will experience a fall in 2020 due to coronavirus and its effects. Much of this will probably stem from the closure of many foodservice outlets.”

browns and mini hash browns. Another leading US-based supplier is Ore-Ida, which is owned by KraftHeinz and includes Homestyle Mashed Potatoes in Original Butter, Garlic and Sour Cream flavors. It also supplies hash browns in varieties such as Golden Hash Brown Patties, Shredded Hash Brown Potatoes and Diced Hash Brown Potatoes, all of which are positioned within the breakfast foods market. Also present in the US is JR Simplot, which supplies a range of products to the foodservice industry under its Edgell brand. These include Hash Brown Triangles, Oval Hash Browns and Mini

Hash brown Triangles, as well as various types of mashed potato (e.g. Redskin, roasted garlic, and mashed sweet potato).

Another of the world’s leading suppliers of dehydrated potato flakes and granules is Aviko Rixona, which forms part of Royal Cosun. Its main production site is based in Venray in the south-east of the Netherlands, although it also operates additional facilities in Warffum (which is also a Dutch-based site) and in China. The company’s products are supplied to more than 60 countries, while it also accounts for 20% of the European market for potato products sold for industrial applications – these include snack foods, soups and sauces. Aviko Rixona also supplies instant mashed potato to customers in the retail sector, in varieties such as added vegetables and with added milk powder and spices. Elsewhere, Aviko UK’s range includes hash browns,

hash brown bites and hash rounds, which the company tends to market as a breakfast component or a snacking option.

McCain is also present in the global market – for example, it supplies hash browns via retail channels in both the UK and Australia. Its foodservice range is considerably more extensive – in the US market, for example, it supplies products such as Skin-On Hash Brown Cubes, Reduced Sodium Skin-Off Homestyle Mashed Potatoes and Unseasoned Skin-Off Redskin Mashed Potatoes. Elsewhere, potato flakes are supplied to foodservice customers by leading food multinationals such as Nestlé and Unilever (the latter under its Knorr brand). These are marketed as ideal for the manufacture of potato croquettes, soups, gnocchi, pizza bases and schnitzels. Typical health claims include being free from MSG and artificial colors. •

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Cedric Porter



US Potato Industry Ponders Over-Supply Issue

With crops still growing in the ground – and some of them being ploughed in – the US potato industry is asking: “How can we reduce the size of this year’s market over supply,” writes **Cedric Porter of World Potato Markets**.

Due to mandated shutdowns, the US potato industry has been reeling from an oversupply of processing potatoes left over from the 2019 harvest, explains Kam Quarles, chief executive of the National Potato Council. “Individual potato growers and state potato associations have distributed millions of pounds of

potatoes to charities, food banks, and local drop off locations nationwide, incurring substantial financial losses in support of the needy despite their own businesses being threatened by the pandemic,” he says. “We desperately need Congress and the Administration’s partnership to defend America’s family farms in this crisis and believe the latest

support package is a positive step in that long road.”

FINDING OTHER OUTLETS

Some processors began early, by encouraging growers to find other outlets for their contracted crops if possible. Others have been reducing the contracted acreage for 2020 by up to 50%. There have been generous offers by Plains growers to give away the contents of their existing stores. However, these processors remain many miles away from where the primary demand for free food for food banks is: on the Eastern and Western seaboard. JR Simplot responded to the situation in North Dakota by closing its Grand Forks plant two weeks

“Canadian potato stock figures from Agriculture and Agri-Food Canada show stocks of 1.462 million tons, which is 13.1% more than in May 2019.”

earlier in April to allow annual cleaning to take place. The plant is expected to re-open this week. Although more potatoes are grown in Idaho, Washington State is the most reliant on the processing industry, with 90% of the potatoes grown in the state destined for fries and other products. The Washington State Potato Commission has launched a drive to give away one million pounds (450 tons) of potatoes to the needy. Washington's three main processing companies are reported to have reduced this year's contracted acreage by between 14 to 35%. Plantings are expected to be down by 20% this year.

GOOD FIRST QUARTER

COVID-related restrictions were non-existent in many states for much of March. If anything, there was a rush towards stockpiling, driving up demand. While the current situation looks bleak, then, the first three months of 2020 were buoyant. Potatoes USA recorded a 19.4% increase in frozen-potato sales during this period and a 9.4% increase in sales of potato chips/crisps. The total value of the US domestic sales during this quarter was USD3.365bn (EUR3.11bn), 15.5% higher than in the previous year.

While fry processors are taking a hit due to the closure of restaurants and food service outlets, chip/crisp processors have a different story to tell. In Michigan, which is the largest producer of chipping potatoes, chips sales have been compensating for the gap left by food service. Here the worry has been whether there will be enough chipping varieties around to last until June, when the new crop comes on stream. Large bags of chips are reported by Michigan Potatoes to be "carrying the industry" although the manic pace has quietened since early April. Sales of small bags has declined as sandwich shops remain closed. Some chipping potatoes have been diverted into soup production. All eyes are now on how quickly the food service sector re-opens in the US, as this will take pressure off the

need to export fries globally. It is likely to be a patchy reopening, given that a reported 7.7 million jobs were lost in the US leisure and employment industry in April, a fall of 47%. Nearly three quarters of these jobs are in the food service and bars. A return to the regular sporting calendar fixtures would be one way to help boost fry sales. In March US frozen fry exports fell by 11.5% in March, to 88,399 tons, compared with March 2019.

Buoyant sales to Mexico helped shore up the loss of sales in the Covid-stricken Far East.

LATER SEASON HELPS CANADA REDUCE PLANTINGS

The later planting season may have helped Canadian growers weather the Covid-19 effect on world markets. On 24 April, The Potato Growers of Canada warned growers that French-fry companies would



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US stocks of frozen potatoes and potato products in tonnes

	Mar-31 2020	% change	Feb-29 2020	YOY% change	Mar-31 2019
Total frozen potatoes	593532	+4.7	566765	+1.3	585956
Frozen fries	488457	+4.3	468369	+3.7	470931
Other frozen	105075	+10.0	95566	-8.6	115025
Total stocks by region					
Pacific	239020	+2.8	232429	-2.7	245674
Mountain	116800	+7.0	109148	-5.1	123040
East North Central	74577	+5.8	70482	+29.6	57551
West North Central	58908	-1.0	59483	+10.6	53256
South Atlantic	39538	-0.5	39754	+2.3	38654

Source: USDA



be looking to reduce their contract amounts by 15 to 30% this year. Although it predicted that demand for table-top varieties would be stronger, with likelihood of processing varieties ending up on table tops, it suggested that farmers might want to consider reducing their fresh potato acreage by 10 to 15% in response.

Canada's biggest potato processor, McCain, has been doing its bit to reduce the surplus by committing to donate 20 million lbs (9 000 tons) – which equates to some 60 million servings of spuds – to foodbanks across the country. It has also made a donation of CAD1.3million (USD930,000; EUR860,000) from the McCain Foundation. McCain's

concerns about the decrease in demand for potatoes from the foodservice industry as a result of the COVID-19 pandemic has also led it to lay off staff at its processing plant in Carberry, Manitoba. More than a quarter of the company's potato-grower partners in Canada are based there.

Cavendish Farms is approaching the surplus problem from the finished product. Its Filling Freezers with Love initiative, aims to donate over 50,000 packs of frozen potato products across seven Canadian provinces, as well as to make donations of CAD1m (USD710,000; EUR660,000).

Canadian potato stock figures from Agriculture and Agri-Food Canada show stocks of 1.462 million tons, which is 13.1% more than in May 2019. Stocks in Prince Edward Island are 18.0% higher, at 436,800 tons, the Brunswick figure is 8.2% higher, at 217,000 tons, with Alberta 7.7% higher, at 339,300 tons. Manitoba is 20.8% up, at 272,000 tons and Quebec is 4.8% higher, at 131,500 tons.

There were 1.040 million tons of processed potatoes in US stores at the beginning of May – 12.5% more than last year – with 5.9% more fresh potatoes, at 171,800 tons, and 21.5% more seed, at 25,050 tons. The higher seed stocks suggest much smaller planting for the 2020 crop. Canadian frozen fry exports in March were only 2.2% less than in March 2019 at nearly 88,000 tons. •

World Potato Markets is a weekly review of potato prices, production and trade.

See www.worldpotatomarkets.com for more. *World Potato Markets* has recently launched a new podcast called *PlanetPotato* celebrating potato culture. Listen to it here <https://www.buzzsprout.com/1028971> and follow *PlanetPotato* on twitter @PlanetPotato.

“Due to mandated shutdowns, the US potato industry has been reeling from an oversupply of processing potatoes left over from the 2019 harvest.”

It's all about POTATO



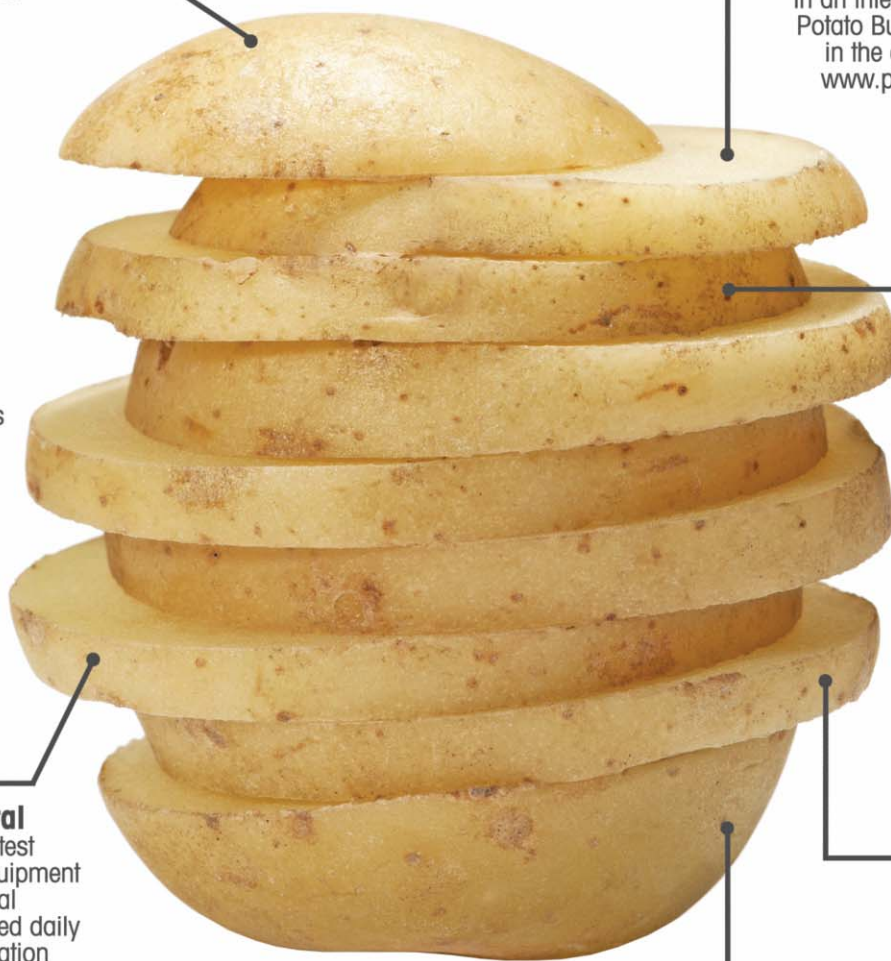
POTATO PROCESSING INTERNATIONAL

Potato Processing International has been serving the global potato processing industry for 25 years and is regarded as a must-have information source for potato processors, equipments and ingredients manufacturers, as well as players in storage, retail and foodservice. This business-to-business magazine is published six times per year and continuously strives to be the most comprehensive publication, containing in-depth articles, expert views from some of the most respected companies in the industry, exclusive interviews, as well as news and trends.



POTATO BUSINESS Portal

From breaking news to the latest innovations in processing equipment and potato products, the portal potatobusiness.com is updated daily with the most relevant information for all players in the potato processing and storage industries. Regarded as a trusted source of information, the website also contains exclusive blog articles and white papers on various current topics that concern the potato universe.



POTATO BUSINESS DIGITAL

Tailored specifically to meet the needs of the busy professionals in the potato industry, Potato Business Digital is the first industry standardized digital magazine for tablets and mobile phones. This quarterly online publication presents exclusive articles on various processing topics, as well as information on ingredients, food safety and storage innovation, in an interactive and dynamic form. Potato Business Digital is available in the click-to-read format on the www.potatobusiness.com portal.



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- Custom e-blasts using specific segments of our e-database, depending on the client's needs, with measured results.
- Special e-blast covering major worldwide trade fairs.



SPECIAL PROJECTS

- May - Potato Business Dossier 1
- November - Potato Business Dossier 2



A COMPLETE COMMUNICATION PLATFORM

In Search of the Perfect Balance

Consumers want great taste and texture in addition to better nutrition, and processors know how important it is to use oils that strike the perfect balance to deliver all three attributes. That's why most edible oil producers fit for frying offer several options for in the industry, along with the expertise to utilize them, thus helping processors create products that meet consumers' demand for great taste and texture, in their pursuit of better-for-you chips and fries.

By Dan Orehov

According to information from The EU Vegetable Oil & Protein Meal Industry (Fediol), frying improves the sensory appeal of food, especially by giving food a crunchy texture and rich taste. During frying, a double transfer takes place: water is released from the food and oil or fat enters into the food. In addition, during deep-frying, the food is subject to chemical and physical transformation at high temperature, which can result in diverse effects. Over repeated frying cycles, the frying medium deteriorates due to processes such as oxidation and polymerization, which lead to changes in the performance of the oil or fat.

FACTORS INFLUENCING THE ABSORPTION OF OIL/FAT DURING FRYING

In order to align food development with consumer trends towards healthier, lower-fat products, it is important first of all to gain an understanding of the mechanisms underlying oil or fat uptake into food during frying. The challenge, ultimately, is to be able to reduce the fat content of the fried food without compromising on texture and taste. The uptake of oil or fat by the food depends on several factors such as the following:

- The ratio between the exchange surface food/frying medium and the volume of the food: the oil/fat absorption increases when the thickness of the food decreases and the volume increases.
- The dry matter of the food: the higher the amount of moisture leaving the food, the higher the oil/fat absorption since vapor leaves voids (or channels in the surface of the food) for the oil/fat to enter in.
- The duration of frying: influencing both the water loss and oil/fat absorption.
- The frying temperature: higher temperatures mean less absorption of oil/fat, because the force of the steam trying to escape from the food pushes against the migration of the oil/fat into the food.

NUTRITIONAL ASPECTS OF FRYING

According to Fediol, during frying, water in the food is lost and fat is taken up, which increases the calorie content of the food. The fatty acid profile of the food may also change depending on the choice of the frying oil/fat. Because of the higher fat content and increased caloric density of fried foods, their consumption is usually considered to be unhealthy, and is often associated with

“Specialists in the edible oil industry say that the choice of frying medium is key to ensure the consumption of fried foods that are as safe and nutritionally acceptable as possible.”



“Over repeated frying cycles, the frying medium deteriorates due to processes such as oxidation and polymerization, which lead to changes in the performance of the oil or fat.”

increasing levels of obesity and cardiovascular disease risk. However, few studies have evaluated a direct association between fried foods and chronic disease risk, and their results have shown wide variations. The variability in obtained results could be due for example to the type of oils or fats used for frying, the quantity of consumed fried foods, the frying technique (for example, single use or re-use of the frying medium), or the study criteria (i.e. evaluating the effect of fried foods or the effect of fried foods associated with other foods or dietary patterns). Frying can also be associated with increased levels of trans fatty acids in foods. These acids are a type of unsaturated fatty acids, which have been linked to potential health risks. In the past, partially hydrogenated fats, which have elevated levels of trans fatty acids, were often used as frying medium because of their high oxidative stability. Over the years however, most of these fats have been replaced with other vegetable oils and fats containing virtually no trans fatty acids. Although there are no clear conclusions on the impact of fried foods on health, it is recommended to moderate their consumption as part of an overall balanced diet, according to, among others, research from The German Society for Fat Science.

THE CHOICE OF FRYING OIL/FAT

Specialists in the edible oil industry say that the choice of frying medium is key to ensure the consumption of fried foods that are as safe and nutritionally acceptable as possible. Consequently, the choice should be based on the most appropriate balance between heat stability and nutritional properties. Vegetable oils that have high content of polyunsaturated fatty acids such as rapeseed, soybean or sunflower oils are nutritionally more favorable are sensitive to oxidation and thus should only be used for a very limited number of repeated frying. Palm oil, which contains more saturated fatty acids, presents higher heat stability, but may be less acceptable nutritionally. The ideal frying medium may therefore be a blend of several oils or fats that have complementary properties. Also, high oleic sunflower oil, high in mono unsaturated fatty acids and presenting high heat stability, is increasingly used for frying. This opinion is shared by Fediol, which represents the interests of the European oilseed crushers, vegetable oils producers/processors and protein meals producers. With more than 35 companies in 16 EU countries, the organization

members crush 36 million tons of oilseeds a year, and refine 17.5 million tons of oilseed/soybean oils and tropical oils, which amounts to 90% of the European food market for vegetable oils and fats (excluding olive oil). There are more than 150 vegetable oils and fats production facilities across Europe, employing approximately 20,000 people.

IN CONCLUSION

Generally, specialists agree that there is no ideal frying shortening which satisfies all applications in every aspect, as sometimes suggested by some in the industry. The reason lies in the different type of products, frying conditions, further processing, storage and expected shelf life. In order to choose the best product, one should prepare a list of important attributes. Functionality or nutrition may sometimes contradict with the commercial view. Therefore, any product chosen will be a compromise on at least these three factors mentioned above. •





Controlling Humidity and Moisture Loss

Humidification is most commonly used in ambient processing stores held at warm temperatures ($>6^{\circ}\text{C}$). By supplementing the moisture content of the air through humidification, there is scope to increase its relative humidity (RH) and reduce moisture loss from the crop.

By Dan Orehov

A further benefit of humidifying is evaporative cooling. According to specialists from AHDB, if moisture is evaporated during the ventilation process, it has the effect of cooling the air at the same time. This means systems using humidified air can operate at tighter air/crop differentials as the differential is widened as a result of water evaporation. This is known as adiabatic cooling.

TYPES OF SYSTEMS

AHDB experts recommend that humidification systems should only be used in well-sealed buildings with a close level of temperature control (range $<0.5^{\circ}\text{C}$). This is because as humidity increases towards saturation, the tolerance for temperature variation before condensation occurs is reduced. It should also be noted that humidification cannot be expected to rectify major dehydration deficiencies

caused by incorrect ventilation control or poorly specified refrigeration systems.

By type, the below are some of the most commonly used humidification systems in potato storage.

- Cell humidifiers use a special perforated, treated paper membrane (cell) down which water is cascaded to humidify air blown through the membrane at right angles to the water flow. The cell has a very high surface area to optimize the uptake of moisture
 - Atomizer systems/Ultrasonic atomizers use compressed air to shatter the water into a very fine mist. Delivery of the water to the air is through nozzle(s), which are usually placed within the ventilation duct of the store.
 - Spinning discs - this method of humidification uses a high-speed rotary atomizer to break the water supplied to the disc into a fine mist that then enters the store through the ventilation system
- “Potatoes have a high water content

“As air moves through the potatoes, it evaporates moisture on the skin and picks up heat that lowers its relative humidity, increasing its drying capacity. Where the skin of the tuber is not intact, increased moisture loss will occur.”

AHDB

(over 70%) and, in storage, lose moisture over time through evaporation to the environment around them. At 4°C, tubers reach equilibrium (i.e. they neither lose nor gain moisture) when the surrounding air is at 98% relative humidity (RH), very close to saturation. As the RH of air surrounding stored potatoes falls, water loss increases," AHDB explains. "Ventilating a potato store will always, to some extent, dehydrate the crop. As air moves through the potatoes, it evaporates moisture on the skin and picks up heat that lowers its relative humidity, increasing its drying capacity. Where the skin of the tuber is not intact, either due to poor skin set or unhealed wounds, increased moisture loss will occur."

RISKS OF DEHYDRATION

The risks of dehydration from ventilation can be minimized in several ways:

- by harvesting with set skins – this is a critical measure to minimize moisture loss from the tuber. Because the potato's skin acts as a regulator governing the rate of moisture from the tuber, the actual amount of moisture lost is proportional to the ventilation time during the holding period
- optimize the ventilation time by regulating the quantity and temperature of the air used to reach the required storage condition – this is best done using an automatic ventilation controller, as this will bring on the fans only when ventilation is required and the air is suitable for use
- the effects of dehydration can also be exacerbated by deep-pile storage (>4 m deep), where it is common to see some evidence of compression damage in crops removed from

"Real time weight loss measurement and product humidity sensors make it possible to improve storage efficiency by fine-tuning climate control computer settings based on new measurements."

Tolsma-Grisnich

long-term storage. In severe cases, compression damage can be seen within boxes, where depths are seldom much more than 1 m.

WHY IS HUMIDIFICATION CONTROL NECESSARY?

Dehydration has many negative consequences for the crop, according to specialists from Omnivent. This is why humidification control for the potatoes provides a solution that confers several benefits:

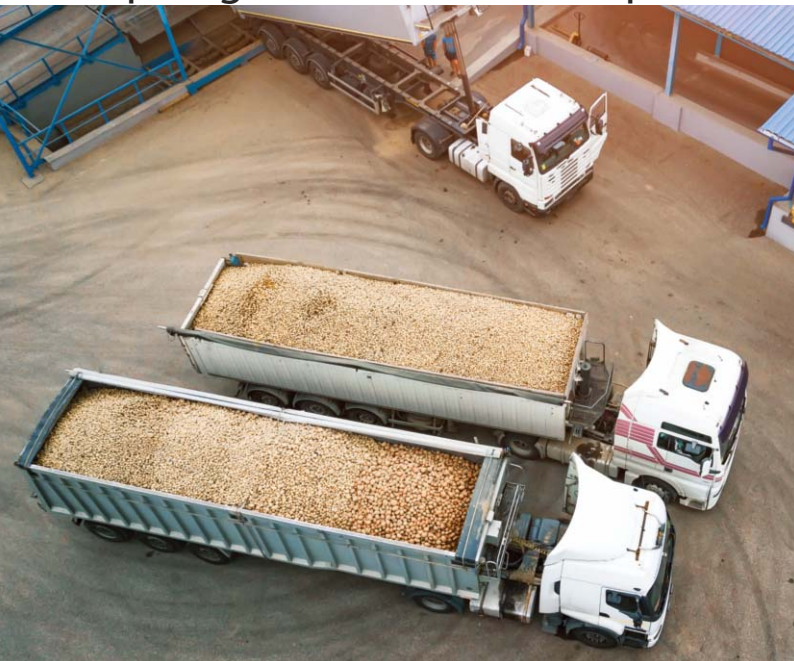
- Humidification control limits weight loss
- Humidification control improves produce quality (fewer pressure marks)
- Humidification control prevents condensation and mist formation in the storage facility
- Humidification control has a cooling effect, reducing the need for ventilation with outdoor air or mechanical cooling.

"Humidification control raises the RH in the storage facility. An increase from 94% to 98% RH at the same temperature reduces moisture loss from the potatoes by a factor of 3, according to our findings of the "Humidification control with OmniBreeze" pilot project, in cooperation with LambWeston," explain Omnivent representatives. To measure temperatures, humidity

and CO₂, measuring units are used to measure and present data to the storage operator. Measuring units are most of time integrated in the climate control computer. As end of the control line remote control of a storage by e.g. mobile phones is possible by climate control computers which are connected to the internet. According to experts from Tolsma-Grisnich, nowadays each newly built storage for processing potatoes is standard equipped with temperature, relative humidity and CO₂ sensors. The measured values are stored in the storage control computer or in the cloud.

"Newly developed sensors will make it possible to automatic adjust computer settings based on unique quality measurement of the potatoes. Real time weight loss measurement and product humidity sensors make it possible to improve storage efficiency by fine-tuning climate control computer settings based on new measurements. To decide when potatoes are dry can be automated with the product humidity sensor. By measuring the conductivity between potatoes, the humidity can be determined. This information can be used to decide when the drying phase can be finished and the computer can be set to cooling," the Tolsma-Grisnich specialists end. •





What Might the Remainder of The Year Look Like?

In order to aid business decisions, AHDB has published its potato balance sheet. This highlights supply and demand estimates for the 2018/19, 2019/20 and 2020/21 seasons. Evidently, in these ever-changing times, the outlook remains unclear, largely working from scenario B outlined later in this article.

By Vikki Campbell, Arable Market Specialist Manager, AHDB

The past couple of months has been a tumultuous time, with the potato industry not immune to this. Social distancing, and a national lockdown, have altered behaviors and markets enormously. Food service and hospitality industries have largely ground to a halt, and won't look to resume until July 4 at the earliest. Moreover, when businesses can reopen, it will not be in the guise we recognized prior to lockdown. The big question remains – for how long will these restrictions be in place?

Here we offer some thoughts around what the short, medium and long-term impacts could be on the potato industry and build on possible scenarios which may impact the market and our balance sheet assumptions.

PACKING SECTOR

The packing sector experienced a large sales bump at the end of March, as consumers panic bought and

stockpiled. Since then, retail levels have returned to more the norm, as consumers work their way through stockpiles and shopper frequency at supermarkets is reduced due to social distancing measures. Given that the packing sector is c.75-80% retail market focused, the large-scale closure of food service and hospitality has not been felt as keenly as in other sectors.

SCENARIO A: FASTEST RETURN TO "NORMALITY"

In scenario A we would assume that daily life would begin to return to normal from mid-May, with life phasing back gradually and back to normal by November. There is no second wave. Given this, the packing

sector might continue to see a small uplift in Q3 and Q4 of this year, with levels returning to seasonal norms at the beginning of 2021. Until social distancing measures are eased, and consumer confidence returns, we would expect in home eating occasions to be increased on average levels. Scenario A would also potentially have the most limited economic impact. A downturn in the economy has a direct effect on peoples spending habits in eating out. Indeed, after the 2008 recession, the hospitality industry suffered a heavy decline, only really starting to recover 5 years later. At the time, a PriceWaterhouseCooper survey found that the first two cuts to

“The retail sector accounts for c.40-45% of the processing market and as for the packing sector, retail sales saw large uplifts during the initial lockdown period.”

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expenditure consumers would make in times of hardship were on fast food (14% of respondents) and eating out (11% of respondents).

SCENARIO B: THE "MIDDLE GROUND"

Scenario B sees a slower reopening of the nation from June onwards, with a full cessation of lockdown by December. This could provide a larger, longer uplift for the packing sector. Consumer confidence may well be more impacted, affecting footfall and dining out opportunities. With the public more likely to eat at home, potentially moving festive gatherings to smaller home-based occasions rather than out of home, this could boost the packing sector volumes and average consumption levels may not return to seasonal averages until Q2 2021.

SCENARIO C: UK RE-ENTERS A SECOND LOCKDOWN PERIOD

Scenario C could be felt if the UK enters a second lockdown period if a second wave of the virus hit after the current lockdown eases. This might see a lockdown situation maintained until the beginning of next year, with schools not returning until January and the hospitality industry phasing a reopen from March. For the retail sector, the fourth quarter of this year could see the largest potential uplift as festive gatherings usually held out

of the home could be replaced with in home occasions, as with scenario B. This again in turn could provide a sizeable boost to the packing sector. In all scenarios, there is a downturn in foodservice demand, felt most severely in the longer lockdown period. However, with overall foodservice demand accounting for c.20% of the sector, the overall uplift for the packing sector should remain positive for all scenarios.

PACKING SUPPLY

However, as the end of March stocks survey showed, pre-packed stocks in grower held stores were 22% above the five-year average and 19% higher than at the same point a year earlier. While prices for best quality have been holding of late, a combination of high volumes and repurposed processing and chipping stocks entering the fresh supply chain may very well weigh on prices for the rest of the season. Imports only make up a small proportion of domestic supply, ranging between 5-10% of total availability. Given that North-West Europe is one of the main suppliers, and they have been experiencing similar purchase behaviors to the UK during the pandemic, their domestic demand has likely increased. Coupled with this, the output at ports due to staffing illness and social distancing has been negatively affected. Therefore, it seems sensible to

assume that the UK packing sector will not face a significant threat from cheaper imports.

PROCESSING SECTOR

With a fall in this season's demand, and only a very limited volume of stock able to be repurposed, it seems sensible to assume there will be a sizeable carry into next season. Additionally, the same is true on the continent. Currently, processors are honoring contracts, but with cold stores full, some are making heavy losses selling excess material for animal feed – for as little as EUR10/t in some cases. If there is the opportunity to find a home for this product in a more viable market, they will surely be considering this. While it is anticipated that the European processing area (which is the predominant sector on the continent) will decrease this year, this is following several years of expansion. Therefore, should the area remain sizeable, and growing conditions prove clement, then we might expect another decent production year on the mainland. In the face of a large carry from the 2019 harvest, these extra continental supplies could weigh on the UK market.

DEMAND OUTLOOK

The retail sector accounts for 40-45% of the processing market and as for the packing sector, retail sales saw large uplifts during the initial lockdown period. In scenario A, this uplift could maintain until the end of the year, until the hospitality sector returns to more "normal" levels. However, the economic impact could hold back dining out occasions, as highlighted in. The potential decreases in volume are shown above, with only scenario A showing a return to average levels during the next four quarters. •

“Currently, processors are honoring contracts, but with cold stores full, some are making heavy losses selling excess material for animal feed – for as little as EUR10/t in some cases.”

2020 FEATURE PLANNING

1 JANUARY/FEBRUARY

Ad closing 10.01/Publishing 24.01

FRUIT LOGISTICA SPECIAL - Key Exhibitors Road Map and Event Agenda

Processes

Pre-cleaning, Washing, De-stoning
Cutting, Peeling, Slicing
Transportation, Product Handling

Expert View

Cutting it to Perfection
Automatic Defect Removers Used in Potato Processing

Spotlight

Potato Varieties for French Fries and Chips

Markets

Western Europe

Products

French Fries

Storage Special

Store Preparation and Hygiene
Drying and Ventilation

Trade shows: LAMMA UK, Potato Expo USA, Global Potato Conclave (India), International Potato Technology Expo 2020 (Canada)

2 MARCH/APRIL

Ad closing 13.03/Publishing 30.03

Processes

Drying and Dehydrating
Sorting, Blanching
Process Monitoring

Expert View

The Optical Sorting Revolution
Advancements in Drying Technologies

Spotlight

Robotization, IoT and Industry 4.0 in Packaging

Markets

Eastern Europe

Products

Classic Chips - Consumers' Favorites

Ingredients

Batters, Coatings

Storage Special

Integrated Storage Management Platforms
Energy Efficiency in Storage

3 MAY/JUNE

Ad closing 15.05/Publishing 03.06

Processes

Frying and Cooking
Oil Filtration, De-fattening, Filtering

Expert View

The Future of Modern Frying Equipment
Pulsed Electric Field

Spotlight

The Latest Reports on Acrylamide

Markets

The US and Canada

Products

Flakes, Pellets and Mashed Potatoes

Ingredients

Best Frying Oils

Storage Special

Humidity and Condensation Control
Cooling and Freezing

Trade shows:

Starch Expo (Shanghai),
European Association for Potato Research Conference (Poland)

4 JULY/AUGUST

Ad closing 10.07/Publishing 27.07

Processes

Conveying Systems and Belts
Cooling and Freezing
Forming and Extrusion

Expert View

Cutting it to Perfection
Traceability and Track & Trace Systems in Processing
VFFS Packaging Innovation

Spotlight

Weather and Its Effects on Potato Crops

Markets

Asia-Pacific

Products

Extruded, Pasteurized and Formed Potato-based Snacks

Ingredients

Salt Reduction and Health

Storage Special

Heating in Storage Facilities
Monitoring and Quality Control

Trade shows: Potato Association of America Annual Meeting, Potato Demo Day (Netherlands), Europat Congress

5 SEPTEMBER/OCTOBER

Ad closing 28.09/Publishing 12.10

INTERPOM PRIMEURS SPECIAL - Key Exhibitors Road Map & Event Agenda

Processes

Batch Frying Equipment
Optical Sorting Innovation

Expert View

Improvements and Advancements in Batch Frying Equipment
Chips Frying Equipment: Investment and ROI

Spotlight

Food Safety Regulations for Potato Processing Plants
Cleaning and Sanitation Updates

Markets

South America

Products

Batch Fried Chips - The Health Trend and Its Influence on Consumers

Ingredients

Flavors and Seasonings for Chips and Fries

Storage Special

Latest Refrigeration Technologies
Sprout Suppressants in Storage

Trade shows: Potato Europe, Pack Expo

6 NOVEMBER/DECEMBER

Ad closing 13.11/Publishing 03.12

Processes

Coating, Flavoring, Seasoning
Conveyors and Conveying Systems
Turnkey Projects

Expert View

Complete Lines for Processing
Innovative Conveyors for Raw and Processed Potatoes

Spotlight

Saving Water, Energy, Oil during Potato Processing
Potato Processing Equipment - Key Suppliers Guide

Markets

Global Market Predictions for 2021

Products

The Future of Potato Snacks 2021

Markets

Processed Potatoes Global Market Trends 2020

Storage Special

Storage Disease Control
Cleaning and Sanitation Updates

Trade shows: Anuga FoodTec 2021



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