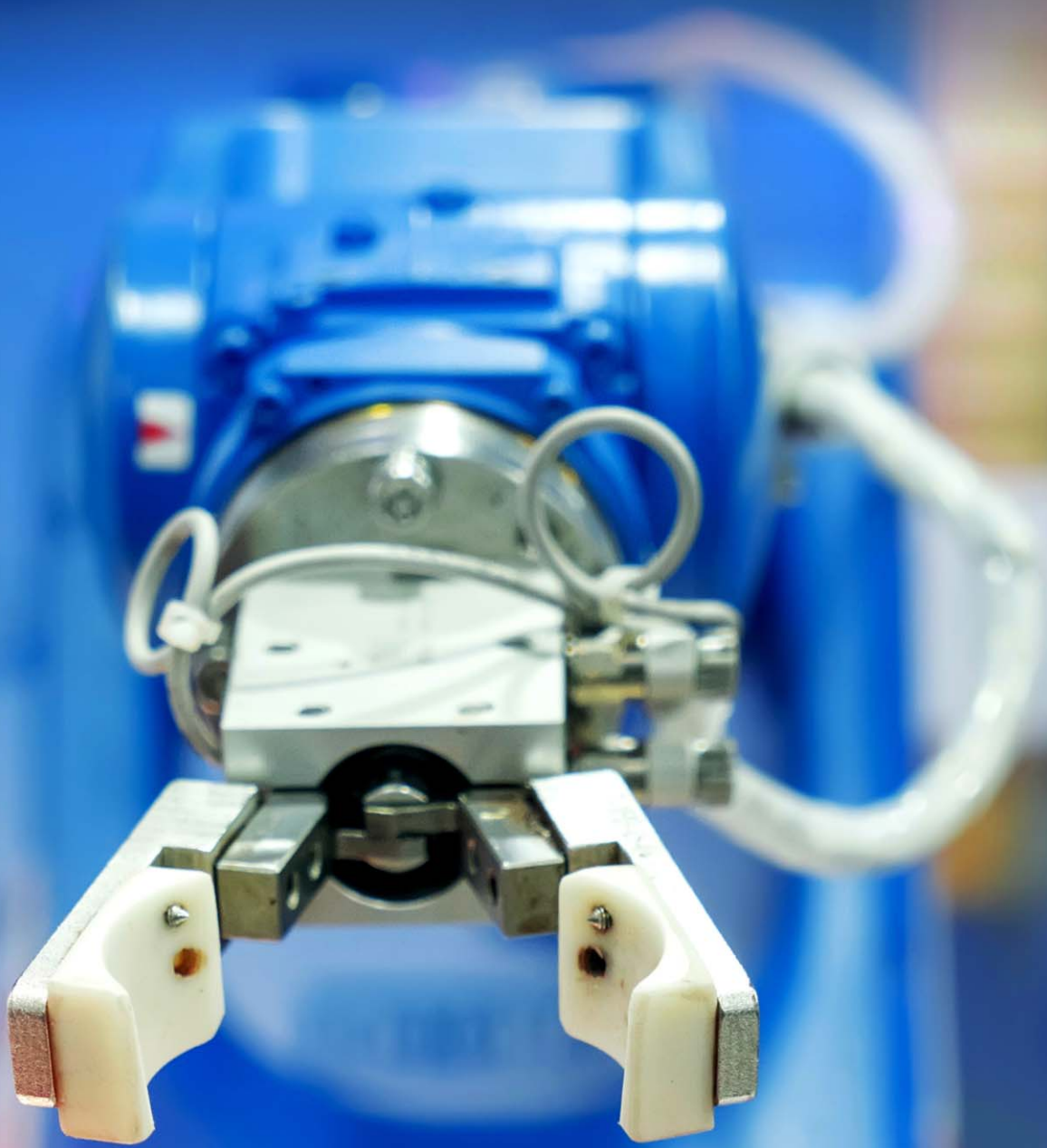
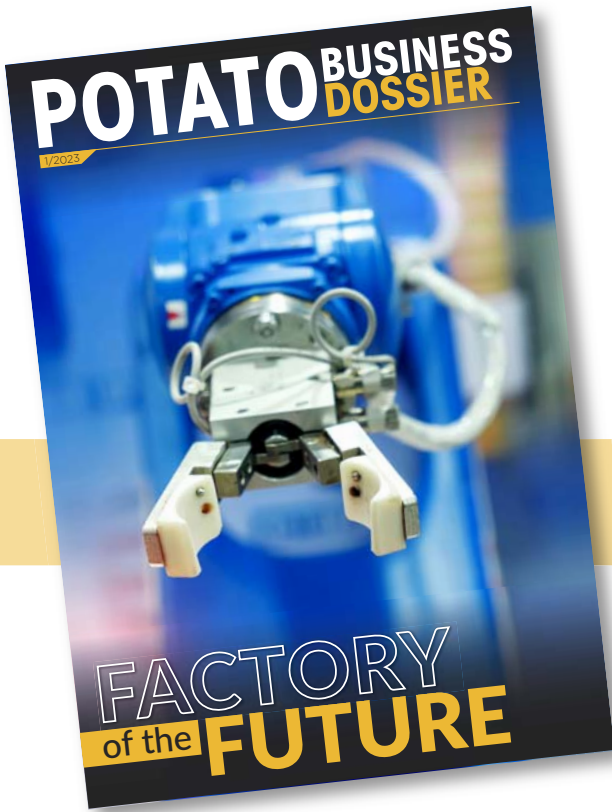


POTATO BUSINESS DOSSIER

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FACTORY
of the **FUTURE**



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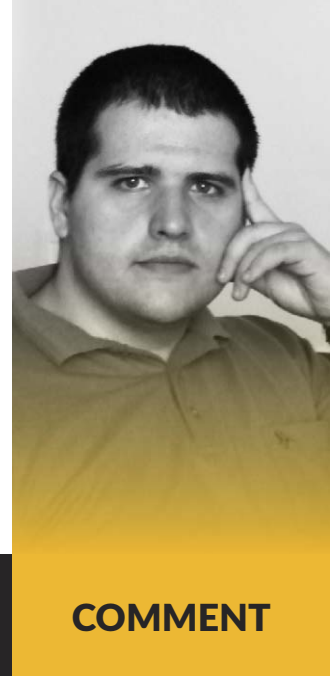
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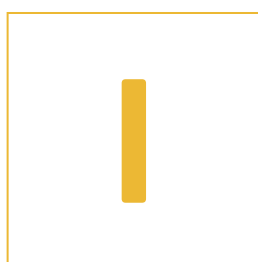
AI-based Innovations Have a Growing Impact on What People Eat



IONEL VĂDUVA
on-line editor

COMMENT

Ionel Văduva



In the potato business, from cultivation to processing and to the supply chain, artificial intelligence (AI) and the practical implementation of machine learning (ML) are increasingly popular. Because it allows quick decision-making, enhances farming commodity practices, and enables the modeling of market prices, crop output prediction is crucial in both local and worldwide marketplaces.

New studies have demonstrated the ability to forecast potato yields using Sentinel 2 satellite imagery and ML methods for three distinct growing seasons. When compared to prior methods, the use of Sentinel 2 imagery offers high spatial and temporal resolutions, and the fitted ML models have proven helpful for modeling potato output. Pre-processing techniques such as “centering” and “scaling” improved model outcomes in general, whereas the effect of feature selection methods varies based on the algorithms.

AI has been beneficial to the potato processing business for several years. Traditional sorting and slicing tools are built to create the same size and form of fry independent of the nature of the potato. However, AI-powered machinery can determine which potatoes are better suited for a lengthy French fry, a wedge, or being propelled over to be chopped into Tater Tots. It is also used during the peeling process, classifying each potato before peeling to ensure that only the necessary quantity of meat is taken. AI is being used also to guarantee that each potato chip has the same pleasing hue and crunch every time. Repetitive activities, such as selecting a poor potato and discarding it, may take a laborer a second or two. Sorters with artificial intelligence can make those choices so rapidly that thousands of pounds of potatoes can be processed in an hour.

AI experiments such as the Flippy 2 robot (which automates the process of deep-frying food such as potatoes) and disease-detecting farm drones have received a lot of media attention recently, but innovations in the middle of the food chain - the system that moves and processes hundreds of thousands of products between the field and the consumer - could have a bigger impact on what people eat every day.

Machines are being taught to think about food in the same way that a chef does, paying attention to differences in form and timing, as well as characteristics like sweetness or texture. As a result, less raw food is wasted, goods arrive in shops fresher and better shaped, and employees are freed up to be more creative. ■

In the potato business, from cultivation to processing and to the supply chain, artificial intelligence (AI) and the practical implementation of machine learning (ML) are increasingly popular.





Merging Big Data to Improve the Total Organizational Effectiveness

Big data merging allows potato processing businesses to reduce waste, decrease supply chain expenses, and improve total organizational effectiveness. Companies can accomplish this by tracking their product's journey with barcodes, RFID tags, and sensors to provide fresh food to end users and eradicate waste.

By Ionel Văduva

V

olume, Velocity, and Variety are the three terms that best describe big data. Some experts say that there is also a fourth source – Veracity (the truthfulness of data, i.e. whether the data comes from a reputable,

trustworthy, authentic, and accountable source). Unsurprisingly, big data has a huge volume. Petabyte (thousands of terabytes) and zettabyte (sextillion bytes)-sized amounts of massive information are used by it. These huge databases aren't as difficult to gather, although such a size may seem unmanageable.

Every system and gadget now produces larger data sets, and these data sets are expanding exponentially. Every machine on the shop floor is producing information, which is overflowing manufacturing sites and can be valuable to businesses.

A production facility can now collect data from almost any type of equipment thanks to the growth of smart technology, including the use of sensors. Individual components can be monitored to foretell equipment failure using variables like temperature, vibration, and shifts in operation. When a piece of machinery is predicted to malfunction using data analytics, any necessary maintenance or component reordering can be scheduled well in advance, reducing expensive downtime.

KEEPING THE PACE WITH A WIDE VARIETY OF DATA

Velocity describes the pace of data generation and the amount of time needed for the data to be available for use. Data can be turned into acts more quickly the faster it is evaluated. Keeping up with this rapidity, however, can be challenging given the data flood of today.

The range of large data, both organized and unstructured, is referred to as variety. A production facility's many touchpoints, including the state of the equipment, customer habits, inventory, and product lifecycle management, create a complicated network of data.

Multiple tools are required to manage this information. For a comprehensive picture of the building, these systems must be integrated and cannot continue to operate in isolation. As an illustration, condition monitoring data may be used to detect when an industrial component is beginning to fail and then immediately cross-reference this information to determine whether the part is available. If a substitute is not accessible, an enterprise resource system (ERP) can be used to repurchase from a reputable automation components provider.

The growing volume, velocity, and variety of data

are all rendered useless without one other 'V' - value. Gathering large amounts of varied data is beneficial, but it must be evaluated and turned into usable insights before it can be helpful to the company.

The rate at which data is generated, as well as the sheer number of factors that can be monitored, can result in massive amounts of data that go unused and unnoticed. Making the most of big data, on the other hand, is a matter of quality over number. Big data can help generate enormous business value by taking a broader look at a facility's business segments and assessing how data can connect them.

REVIEWING DATA AND DETERMINING THE BENEFITS

Smart sensors are increasingly being used in industrial applications, giving insight into processes and enabling makers to collect more data for analysis. As production becomes more constant and profit margins tighten, data-driven food producers will undoubtedly be more adaptable and nimble in responding to issues as they emerge.

More data can be beneficial. For example, if smart sensors, such as the ABB Ability Smart Sensors, notify an operation manager of a failing motor before it reaches a critical condition, the operation manager will have more time to devise a plan of action that reduces downtime and total disruption. However, upkeep is only one element of this growth.

"Harnessing data across the facility can support numerous aspects of manufacturing, from balancing conveyor belt throughput to ensuring continuous optimization. However, if every system is constantly supplying information, it can be hard to discern which data streams to pay closer attention too," ABB experts say.

Computers and data-handling tools are more intelligent than ever before. They can identify patterns and conduct in-depth analyses that can assist production managers and others. However, computerized systems are not yet capable of determining who to transmit data to, so it is



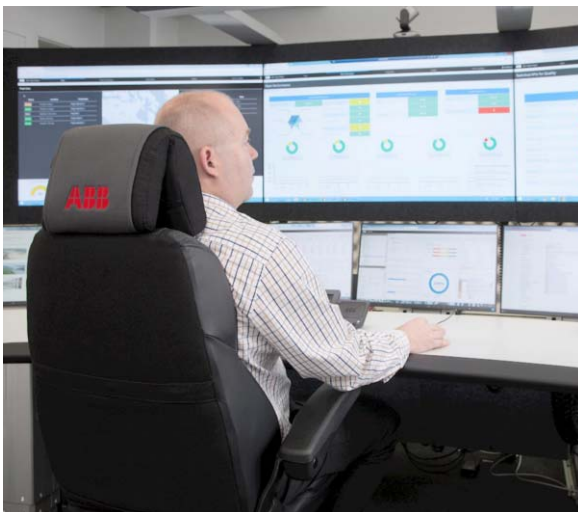
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In typical applications, an ABB customer reported an **84%** improvement in asset reliability over four years and a **22m** USD reduction in maintenance costs, as well as improved process availability, better throughput, and improved safety.

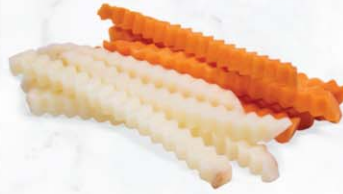
necessary to have specialists on hand to ensure that the correct individual receives the right information at the right moment. Having a system in place that can not only evaluate the ever-increasing amount of data but also a group of experts to examine the data and decide who would profit from it, is thus critical. ABB provides the ABB Ability™ Collaborative Operations technology to enable such a service. This solution consists of a network of dedicated centers staffed by teams of experts who examine a site's industrial data and then package it most beneficially for the client. "The ABB Ability™ Collaborative Operations platform provides businesses with access to specialists that they may not have in-house, such



as cybersecurity. The results speak for themselves. In typical applications, an ABB customer reported an 84% improvement in asset reliability over four years and a USD22m reduction in maintenance costs, as well as improved process availability, better throughput, and improved safety," the company experts point out.

INTEGRATING BIG DATA AND CONNECTIVITY

For many years, many companies sought to integrate big data and connectivity. Now that the technology has matured, it is critical to apply it to achieve effective outcomes. The use of technology to allow predictive maintenance and constant output enhancements must be the new goal. Those working in the potato processing business must be conscious of, and adaptable to, the ever-changing competitive environment. Manufacturers can improve productivity and stay on top of their game by ensuring that their production systems are making the most of industrial data. Having a system in place that ensures the company is never overburdened with information and that those in pertinent positions receive useful and insightful information is not only reassuring, but critical in today's hyper-specialized environment. ■



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A close-up photograph of a person's hands holding a purple mesh bag filled with potatoes. The person is wearing a light-colored, textured sweater and a ring on their finger. The background is a blurred grocery store aisle with other produce. The text 'Optimal Packaging Is a High-tech Commodity' is overlaid on the right side of the image.

Optimal Packaging Is a High-tech Commodity

The most essential role, from packing to transit, storage, and sale, is to ensure that the goods reach private homes in one piece. However, style and material have a significant impact on purchasing choices, as more and more people want food in more sustainable packaging.

By Ionel Văduva

M

ost foods, however, cannot be moved, kept, or sold without packaging, and in their unpackaged form, they would spoil early. The protective covering keeps out detrimental effects such as light, oxygen, and

humidity while also preventing soiling and injury. A longer shelf life contributes significantly to decreasing food wastage.

Every year, more than 930bn tons of food are thrown away worldwide along the complete value production process. This number originates from the most recent United Nations Environment Program report. (UNEP). According to the Swiss organization Food Waste, on average, one-third of all food is lost or wasted on its journey from the farm to the dish. As a result, it is part of the UN Agenda 2030 to reduce global food loss per individual in half by 2030. The writers of the Food Waste Index Report 2021 also believe that food waste accounts for 8 to 10% of world greenhouse gas emissions. Packaging can assist in reducing trash. Packaging is used for more than just taste preservation and storing life. Consumers are becoming more interested in environmentally responsible packaging. It is intended to be recyclable or made of environmentally friendly materials while still providing optimal protection for delicate products. As a consequence, food packaging is now a real high-tech commodity. Food packaging manufacturers are required to adhere to stringent legal rules, which include a high degree of hygiene. However, sanitation encompasses more than just washing and disinfecting. Compressed air is used in a variety of uses, including the culinary industry. If it comes into close touch with food or is used for cleaning, it must also be germ-free.

OPTICAL INSPECTION FOR QUALITY ASSURANCE OF PACKAGED PRODUCTS

Minebea Intec's new vision system series adds a fourth pillar of quality assurance in the shape of end-of-line inspection devices. VisioPointer live provides high-precision results when examining packing labels, print, or the product's expiration date, with three cameras as standard, multiple illumination choices, and extra side and satellite cameras for multi-angle examination. It also offers dependable packing seal examination. In the food business, this is an extremely essential visible quality check because the product's expiry date is only legitimate if the packaging is completely leak-tight.

"The seal inspection is performed by cameras and is fast, non-destructive, and configurable. Conventional methods do not offer these advantages. We are proud to now be able to integrate this outstanding solution into our customers' production processes," Dr. Thorsten Vollborn, Senior Product Manager for Product Inspection at Minebea Intec mentioned. The automated weigh price labeler WPL-A not only makes product tracking easier but also boosts throughput and efficiency. The WPL-A complies with the Measuring Instruments Directive (MID) and National Type Evaluation Program (NTEP) of the National Conference on Weights and Measures. (NCWM). The system is designed and manufactured in Europe to the greatest quality standards, and it provides optimum modularity and connectivity. The gadget is the perfect automatic labeling system, and it can be customized to meet a variety of challenges.

Minebea Intec's Essentus Performance L Combi checkweigher is the newest iteration of one of the company's best-sellers. The novel design integrates the checkweigher Essentus



Packaging is used for more than just taste preservation and storing life. Consumers are becoming more interested in environmentally responsible packaging.





Performance L and metal detector Vistus into a single base structure. As a result, the mechanism is incredibly compact and efficient. At the same time, the combi system checks weights, performs security checks, controls upstream loading systems, and checks for metallic extraneous objects. The Essentus Performance L Combi is also verifiable and equipped with a stainless steel conveyor system, making it perfect for fulfilling hygienic standards, especially for wet uses or unpackaged goods.

ENABLING EFFICIENCY FORMS THE 'PERFECT PAIR' FOR TNA

tna has introduced the tna auto-splice 3 to its packaging inventory, completing the 'Perfect Pair' with the tna robag 3e. By increasing production efficiencies, the invention assists food makers in addressing growing worries about workforce shortages and rising resource costs. The two sophisticated systems offer a new CXE integrated display driver and automated film splicing, which can increase production uptime by 5%.

"The 'Perfect Pair' speaks to the challenges our customers face, and represents an evolution of our portfolio that will deliver real-time benefits. [...] This combined solution has been designed for this age of digital transformation and remote services. Connectivity is king, and intelligent communication between packaging systems and their auxiliary equipment will allow operators to make their lines work even more efficiently, improving their ROI," Alf Taylor, Managing Director & CEO at tna, said.

Because of its simplicity of use, the tna robag 3e vertical form fill and seal (VFFS) packing system is straightforward to operate, service,

and maintain. This latest tna robag, which incorporates the EtherCAT real-time protocol and an incorporated display controller system, reduces cabling infrastructure by 20%, allowing for easier upkeep and lower total installed costs. The tna robag 3e shares core components with the tna roflo distribution conveyors and the tna intelli-flav seasoning system, which reduces the need for spare parts inventory, while smart monitoring and remote networking allow real-time contact for quicker worldwide maintenance support.

The tna robag 3e has integrated management and a refined design for on-the-go monitoring and upkeep. It includes unrivaled diagnostics for electrical components, simplifies cable design and is constructed with fewer parts than its forebears - all while keeping the tna robag's compact size, speed, and efficiency.

With a capacity to produce a broad range of goods at rates of up to 250 bags per minute, the tna robag 3e establishes high performance and quality standards. It not only offers the ability to swiftly and easily swap between pack sizes, but it also offers the highest production and energy efficiency for the same amount of power and resources. Because of the system's better design, product waste is kept to a minimum (0.1%), making packing operations more effective and environmentally friendly.

Expertly designed for seamless cohesion with the tna robag 3e, the tna auto-splice 3 is a unique, compact solution that splices packaging film

automatically, with no downtime or interruption to the packaging process. The new and

unique rotary reel swapping feature makes it easier to access and replace the film roll without having to stop the packaging system, helping manufacturers maximize throughput and achieve faster, smoother film changeovers. ■

With a capacity to produce a broad range of goods at rates of up to **250** bags per minute, the tna robag 3e establishes high performance and quality standards.





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Providing All of the Hardware's User-facing Functionality

The process of writing software that connects with one or more parts of real hardware to create a singular functional system is known as hardware integration, additionally referred to as hardware-software integration or system integration.

By Ionel Văduva

W

hen adding features or providing all user-facing functionality, such as a display screen and management, a single piece of hardware frequently collaborates with a partner piece of software.

Although the intricacy of

hardware-integrated systems can differ, there are five major parts. The first is physical hardware, which refers to the actual piece of equipment that gives the data that is tracked and examined. In/Out (I/O) devices, fundamentally integrated circuits, electronics, and more sophisticated devices like cameras and tiny computer systems are a few instances of tangible hardware.

The sensors are tracking tools attached to the actual hardware that collect data and convert it into a form that a computer can process.

Thermometers, pressure gauges, and specialty timers are some examples of these instruments. Physical (USB cords, Ethernet cables, HDMI cables, and fiber) or cellular methods of contact are both possible. (Wi-fi, Bluetooth, and Bluetooth Low Energy). The software, which consists of programs that let users handle and control actual hardware and the data it collects, is last but certainly not least.

Most hardware integration apps aim to enhance hardware system performance and expand the user interface to the user's device or computer. For example, connecting devices without built-in Internet accessibility to a phone with Internet access can help with cloud backups, updates, and setup.

INFLUENCING THE PROFIT MARGINS OF POTATO PROCESSING BUSINESSES

The concluding component of the "Internet of Things" (IoT) equation is cloud networking of hardware, which can join via 4G and Wi-Fi or an intermediate device like a phone. Of course, additional networking is optional, but it can be very effective when managing a big number of devices in terms of data.

Beneficiaries can generally directly affect their companies' profit margins, boost client happiness, and distinguish their goods in the market by utilizing partner software or other combined system.

Businesses can completely automate quality control by continuously watching and managing the process with the help of a software application. Users can be informed of potential production line failures that might impede output by using a system of linked sensors and gauges for monitoring production failures. Reducing the need for physical work because users' devices can communicate with one another and adjust themselves automatically, saving time on manual calibration.

REMOVING PRODUCTION-RELATED OBSTACLES

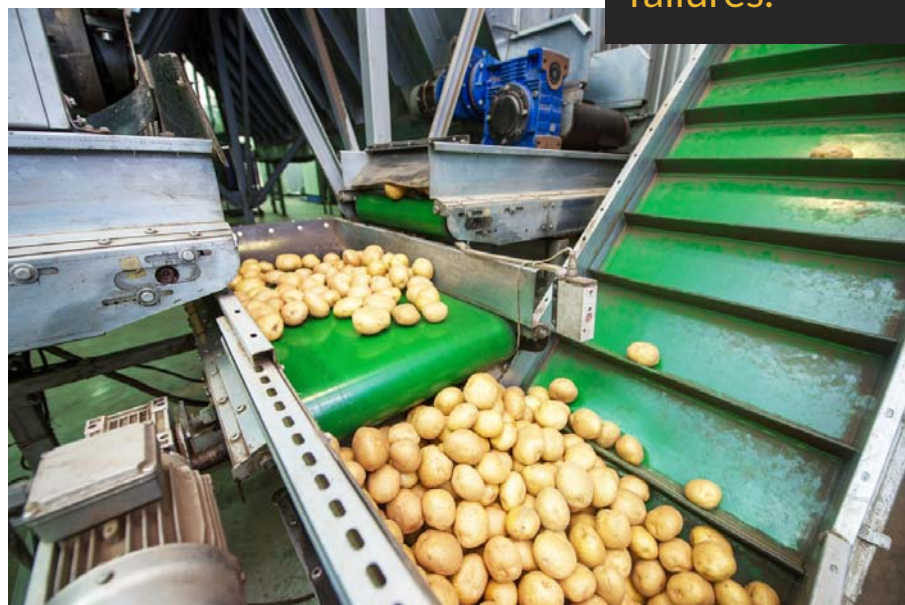
Users can rapidly identify bottlenecks and remove them when they have software that can monitor and analyze data from the complete manufacturing process. When a user's warehouse database is linked to an appropriate analytics dashboard, they can assess and forecast how their inventory is moving and what they need to maintain in storage, which improves inventory control.

When users' hardware needs to be customized and tuned for each task, complex hardware configurations become simpler. A company proprietor of a potato processing facility can simply save his settings and utilize them later on with integrated software.

USING DIFFERENT TYPES OF DETECTION TECHNOLOGY

Two newly developed technologies will soon be - or are already - improving sorting economies. The first is data analytics, and the second is artificial intelligence (AI). Sorters are becoming more adaptable and able to handle new obstacles thanks to AI. The image-processing software for optical sorting must be tightly merged with and tailored for the sorting hardware, including the spectroscopy, laser, and camera sensing systems, processing hardware, and ejection systems.

With better defect and foreign material identification, process management, and proactive maintenance, AI can improve this combination. Any company aiming to increase organizational productivity must now have access to advanced data analytics capabilities. 24/7 simple access to reliable information and insights that are constant and easy to comprehend can lead to instant improvements in outages and operational costs, throughput optimization, and consistency of output that adheres to quality specifications. This is being led by Tomra's brand-new web-based analytics tool,



Businesses can completely automate quality control by continuously watching and managing the process with the help of a software application. Users can be informed of potential production line failures that might impede output by using a system of linked sensors and gauges for monitoring production failures.



The company is currently testing a new version of ID Technology's software suite that was added to the ability to sort other potato varieties in Fall, 2022. "By upgrading to an AI-powered system, packing houses can save both time and money. ID Technology provides reliability and consistency quicker and more efficiently than older systems, which relied more on the skill and experience of the operator. Our potato clients are looking at returns

Exeter Engineering, an American manufacturer of electronic sorting, washing, receiving, and related machinery for the fresh produce industry, has installed an upgraded version of its proprietary ID Technology system that uses artificial intelligence (AI) for their potato packing lines customers, with accuracy rates of **95%**.

Tomra Insight. Sorting and rating equipment is transformed into networked devices that produce useful process data that is safely saved in the cloud. "Tomra builds 'the Rolls-Royce' of sorters, and Tomra Insight is a strong addition to these machines. Using the information, we're getting from Insight, we are now managing product quality more precisely to meet customer expectations, improve product control and allocation, see where we need to help sorters meet targets, reduce waste, and make better use of the equipment with less downtime. We are now also able to give better feedback to our growers. For example, we can flag up very quickly if there are too many unwanted green potatoes coming through for processing. To us, it's clear that Tomra Insight is well worth having," Andrzej Kopacz, Operations Manager at The Jersey Royal Company, the producer of the internationally-recognized Jersey Royal new potato in the Channel Islands, said.

ACCURACY RATES OF 95%

Exeter Engineering, an American manufacturer of electronic sorting, washing, receiving, and related machinery for the fresh produce industry, has installed an upgraded version of its proprietary ID Technology system that uses artificial intelligence (AI) for their potato packing lines customers, with accuracy rates of 95%. The new version 2.0 hardware, combined with a software upgrade, now allows potato packers the option to use the AI to differentiate between three or more grades. They can also use the new "severity classification" feature, which allows operators to adjust for the severity of a variety of defects to move products from one category to another. "With 'Severity classification,' ID Technology is coming out with another unique feature. It allows the sort of granular control that used to come only after an operator had years of experience. Now it's automatic," Matt Lonczynski, Sales Engineer, Exeter Engineering, mentioned.



on their investment in a year, a year-and-a-half. We think there will be a similar result for bell peppers, cucumbers, and other produce types we have in the pipeline," Boomer Batchman, president at Exeter Engineering, mentioned. Different detection technologies are already being used by optical sorters to improve the dependability and precision of detection. The next major technological advance will be fueled by categorization algorithms and improved information utilization, in addition to technological advances in detection technology and expanded data processing powers. Modern detection technologies' latent potential will be unlocked by categorization algorithms based on machine learning and artificial intelligence. "Optical sorting companies have become more and more focused on software programming and this trend will continue with the introduction of Artificial Intelligence. The progress on the software development front requires more powerful hardware to process the additional data load generated by these new tools," Lukas Lackner, Vice President, of Insort, concluded. ■





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Using Reliable Temperature Control Devices During Potato Frying

The fundamental factor that affects the oil content and quality during frying is temperature control. The most important variables that affect acrylamide formation during frying are temperature and duration, although other elements like oil type, soaking time, and potato variety also play a role.

By Ionel Văduva

W

hen certain amino acids, like asparagine, are heated, especially when they are combined with reducing sugars, acrylamide can be released. Early Maillard reaction products can also be heated to produce

acrylamide. The Maillard reaction - a chemical reaction between amino acids and reducing sugars - and, consequently, acrylamide production, is more likely when thin potato chips are first fried at 180 degrees Celsius, followed by drops in temperature.

It is presently believed that asparagine, which is particularly abundant in potato products, is to blame for most of the acrylamide formation in potato chips and French fries. Therefore, it is essential to use trustworthy temperature control devices during frying to avoid overheating and stop the further formation of acrylamide.

In the instance of acrylamide degradation, a rapid high-temperature frying process is preferable to a slow low-temperature process. High temperatures also hasten the creation of the crust, which results in less oil being absorbed than when frying at low temperatures, which takes more time to process.

It can be said that the frying temperature and fat content are inversely linked when it comes to potato chips or strips that are fried to the same moisture content. Lower frying temps result in less non-enzymatic browning, which results in brighter chips in terms of color.

Hardness and frying temperature are also inversely correlated, meaning that a greater frying temperature yields less hardness and crispness.

HIGH-TECH TOOLS FOR TASTY FOOD

To maximize culinary quality while also reducing the acrylamide content, it is crucial to incorporate a system of temperature regulation into the cooking apparatus. This control limits the creation of acrylamide and avoids overheating when frying.

The concept behind MUSE-Tech is the development of three single sensors (Photoacoustic, Quasi Imaging UV-Vis, and a Distributed Temperature) which are to be integrated into a versatile and affordable Multi-Sensor Device (MSD). The MSD will be based on a flexible plug-in architecture for real-time

monitoring (on-/in-line) of multiple parameters associated with the quality and the chemical safety of raw and in-process materials.

Three MSD prototypes were assembled by the Institut de Recerca i Tecnologia Agroalimentaries (IRTA), thanks to a European CORDIS project, calibrated and tested in three case studies, one of them being potato chip frying.

“MUSE-Tech aimed to bridge the gap between state-of-the-art sensing technologies and industrial process analytical technology (PAT) applications to reduce manufacturing costs and food waste,” according to Dr. Massimo Castellari from IRTA.

Lluís Salva Vila, another project participant, added that in potato chip production the products from degraded oil could give an unpleasant taste. Some of these compounds can be assessed at-line, but indicators of the oil quality during frying are not evaluated in real time.

“A dedicated communication system and auto-adaptive software tools were developed to enable the MUSE-Tech Multi-Sensor Device (MSD) prototypes to communicate with plant operators. One of the major results from the project is the proof of concept that MSD can monitor, in real-time, several key parameters of the frying process and, based on predictive models, change critical parameters to improve specific qualities in the final products,” Castellari added.

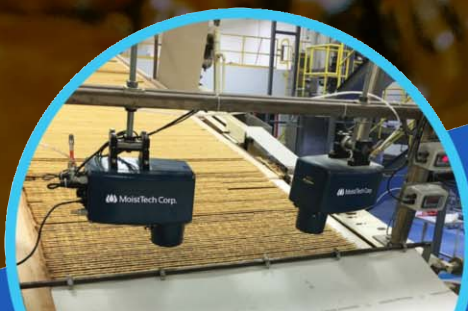
The MUSE-Tech project developed tailor-made sensors that were able to collect data under industrial conditions. These sensors were a distributed temperature sensor (DTS), an optoelectronic sensor, known as a quasi-imaging visible near-infrared (QIVN) sensor, and a photoacoustic sensor (PAS), which surprisingly worked even better in the industrial prover than in the pilot plant. The mathematical models developed to predict the quality of the final product based on data gathered online by the MSD during the process were another interesting result for the potato chip case study.

MAINTAINING ACCURATE TEMPERATURE PROFILES

Raw potatoes can contain up to 80% moisture. It takes a lot of energy to get this figure down to 2%. This is one of the difficulties that snack



The Maillard reaction - a chemical reaction between amino acids and reducing sugars - and, consequently, acrylamide production, is more favored when thin potato chips are first fried at 180 degrees Celsius, followed by drops in temperature.





Raw potatoes can contain up to **80%** moisture. It takes a lot of energy to get this figure down to **2%.**

manufacturers face. A decent fryer design will contain all aspects that allow for an energy-efficient procedure while retaining output quality. “Kuipers multi-injection points fryer enables processors to control their energy input across the length of the fryer and maintain accurate temperature profiles for the desired output. Having temperature profiles within the fryer can also help chip producers explore possibilities concerning the structure of the chips, for example having a harder bite or more crunchiness. In general, the lower the temperature and the longer the process times, the firmer the crust and the higher the oil absorption rate,” business development manager, Valeria Lucinschi, mentioned. MoistTech, on the other hand, has a piece of extensive knowledge and installations in the food industry, including many in various chips. Developing one of their most accurate moisture sensors, the IR3000-F, is an ideally suited management system to measure the moisture content in the potatoes before frying or to monitor potato chip oil levels during the manufacturing process. “The sensor is coated in a food-grade Teflon with a polymeric viewing window enabling manufacturers to improve product quality without any contamination. This state-of-the-art analyzer can also measure temperature, oil, fat, sugar, seasonings, protein, and more, giving the user full process control,” according to the company’s website. Last, but not least, the Process Sensors Corporation’s MCT330SF moisture transmitter is designed to measure moisture, oil, and product

temperature in a food processing environment. The transmitter is housed in a stainless steel enclosure and employs a food-grade optical window. The MCT is optimized with filter combinations to measure moisture and oil at the same time. The viewing window in the sensor is a food-grade polymer. The stainless steel housing is sealed so that the NIR sensor can tolerate a wash-down environment.



“The MCT-330SF is fitted with an air purge assembly to prevent oil or moisture from depositing on the sensor’s lens. The Stainless Steel Enclosure can also be fitted with a Vortex cooler in the event of a very elevated temperature environment,” the company reveals. ■



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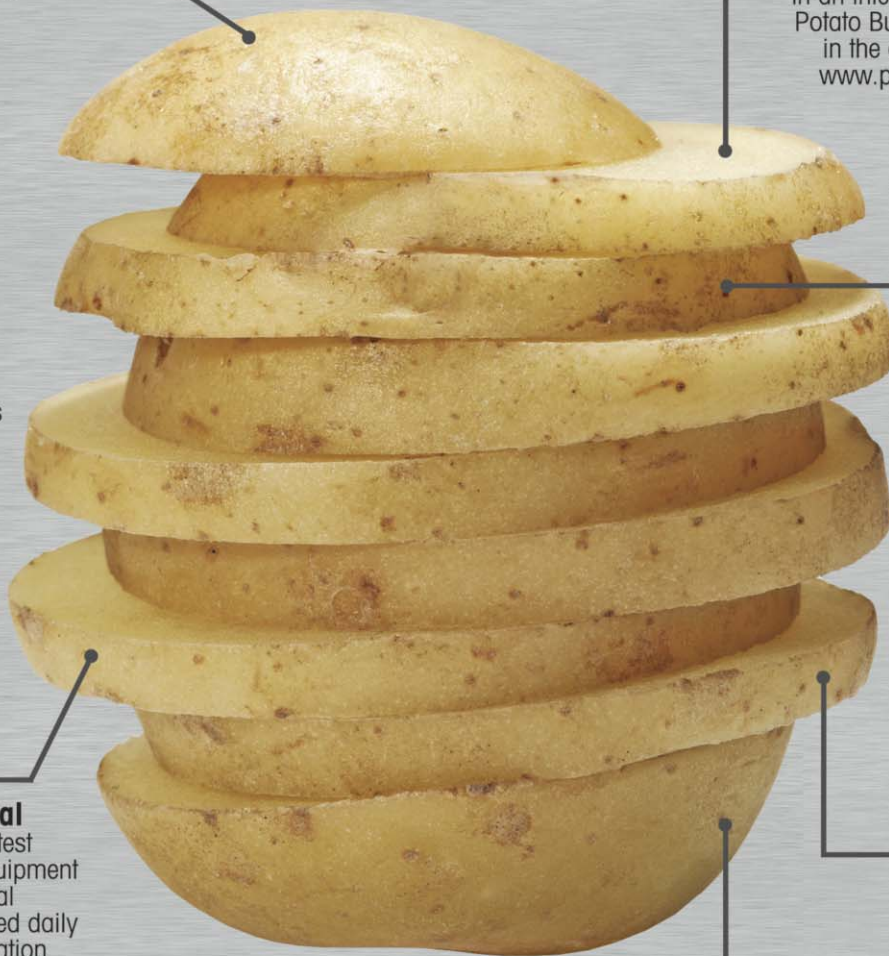
POTATO PROCESSING INTERNATIONAL

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.



POTATO BUSINESS Weekly Newsletter

The latest news, exclusive articles and interviews are delivered directly to your inbox with our weekly newsletter service, containing pertinent information from trusted sources, as well as industry insights and updates.



E-BLAST

- 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

Enabling Real-time Data Collection and Sharing Between Various Resources



The term Internet of Things (IoT, for short) refers to the convergence of traditionally connected gadgets and smart appliances that are all linked to the Internet and working together as a system.

By Ionel Văduva



IoT is one of Industry 4.0's nine key technologies and is a relatively new manufacturing idea. It consists of cutting-edge IT infrastructure for data distribution and gathering, which has a big impact on the effectiveness and

performance of manufacturing systems. IoT enables real-time data collection and sharing between various resources, including machinery, personnel, supplies, and tasks. Sensors, radio frequency identification (RFID), and wireless communication standards are frequently used in real-time data gathering. With the aid of these technologies, it is possible to track and monitor important manufacturing-related data, the movement of materials or people, and a variety of other information in real-time, providing complete visibility and traceability of manufacturing processes. This enhances the effectiveness and efficiency of manufacturing operations by enabling management to make quicker and better choices based on real-time information.

Some businesses are now considering IoT as a way to boost operational effectiveness and its potential advantages by using it as a tool to discover growth in unexpected possibilities. Creating new terms within the IoT concept, such as Industrial IoT (IIoT), and incorporating more elements, also quickened the pace of IoT growth. They predicted that in the future, prosperous businesses would use IIoT to boost production, create new hybrid business models, take advantage of intelligent technologies to fuel innovation and change their workforce to increase their revenues.

IoT is advancing quickly, and it can be improved even more by merging it with other technologies like cloud computing, the future internet, big data, robotics, and semantic technologies.

IIoT is frequently utilized in the production sector to concentrate on industrial applications. It stands for the IoT's industrial subclass, which is already beginning to transform the manufacturing industry and usher in a fourth industrial transformation known as Industry 4.0. The goal of Industry 4.0 is to create intelligent factories where manufacturing technologies are enhanced and changed using cloud computing, IoT, and cyber-physical systems (CPSs). To build manufacturing systems that are interconnected, with the ability to communicate and analyze the gathered data to make better choices, Industry 4.0 integrates advanced manufacturing techniques with the IoT.

Operational efficiency is an important aspect of IIoT, which is achieved by employing automation and agile production techniques such as predictive maintenance to prevent downtime and

plant and facility shutdowns. Companies are starting to realize the huge potential of IIoT: the universe of intelligent industrial products, processes, and services that connect with people over a worldwide network thus boosting new growth opportunities by adding digital services and innovation to their product mix.

A FULL OPERATIONAL OVERVIEW AND THE ABILITY TO CONTROL IT

In recent years, there has been a surge in study interest in the IoT. Academics and business owners have both developed and implemented IoT-based applications for transparency and efficiency in the food industry. Some successful IoT applications have been related to tracking, tracing, and monitoring food products and other resources, which has enhanced efficiency and traceability. It is critical to have a full operational overview and the ability to control it. IoT-based technologies, which include sophisticated self-learning software, artificial intelligence (AI), and wireless connectivity protocols, provide the digital functionalities required to offer seamless integration between various line components, resulting in efficiencies across the board.

Operators can calibrate a complete line to produce almost any product type thanks to wireless integration between line components, which drastically reduces the amount of time needed for changeovers. Because all potential production-slowness factors can be reduced, this has a real, positive effect on line efficiency. Blockages or errors in the conveying system, for instance, can be instantly transmitted to the seasoning, frying, and weighing equipment, preventing product waste and alerting operators to the problem before it results in expensive downtime or tainted batches.

"If we take a vertical form fill and seal system (VFFS) as an example, real-time protocols now



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By feeding it **18k** photos, Japanese food manufacturer Kewpie Corporation and its partner BrainPad, taught the machine learning system to identify excellent ingredients.

come as standard which, along with smart diagnostics and remote connectivity, enable food producers to optimize their lines in real-time via detailed packaging performance reports. Should any challenges arise, the smart operating system and remote communication features within the system give operators access to targeted global servicing support to get production back up and running quickly and easily – minimizing downtime,” Natasha Avelange, Group XR Manager–Projects, at tna Solutions wrote in a recent paper.

SORTING POTATOES FOR THEIR OPTIMIZED USE

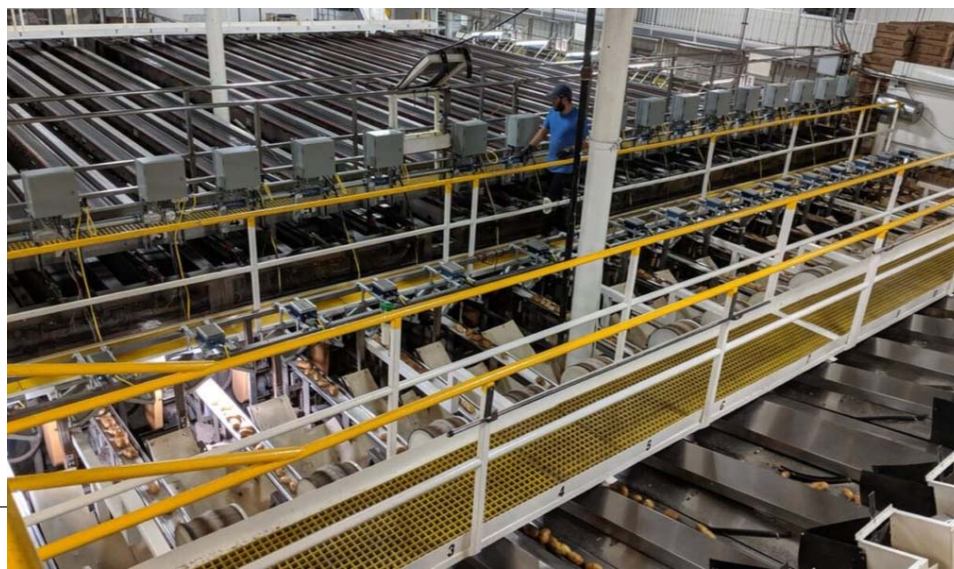
Artificial Intelligence (AI), as an IoT-based technology, is an area of computer science that deals with intelligent machines and deploys two of the most common algorithms: - deep learning

and machine learning. These algorithmic models learn from data and are used by various food processing actors to make predictions and offer the most appropriate solutions to any problem. TOMRA, for example, uses machine learning to sort foods for their optimized use. For example, apart from sorting good and bad potatoes, it uses machine learning to identify which potatoes are best suited for French fries or potato chips production with minimum waste generation. SiftAI potato grading and sizing system is part of the SmartVisionWorks’ product line. Leveraging artificial intelligence, SiftAI can identify potato defects and sizes with industry-leading accuracy. It can also size potatoes to meet and exceed USDA specifications.

SiftAI integrates into existing ejection systems and is a drop-in replacement for outdated optical sensors. To date, SiftAI systems have been integrated into Hagan, Exeter, and AgRay singulation and ejection systems.

Exeter Engineering, an American manufacturer of electronic sorting, washing, receiving, and related machinery for the fresh produce industry, has installed an upgraded version of its proprietary ID Technology system that uses artificial intelligence (AI) to automatically grade and sort potatoes. The ID Technology system has been working on potatoes for over a year, with accuracy rates of 95% on some customers’ packing lines. The new version 2.0 hardware, combined with a software upgrade, now allows potato packers the option to use the AI to differentiate between three or more grades. They can also use the new ‘severity classification’ feature, which allows operators to adjust for the severity of a variety of defects to move products from one category to another. According to Japanese food manufacturer Kewpie Corporation, ingredients used in baby food, such as diced potatoes, are swiftly inspected using Google’s TensorFlow. By feeding it 18,000 photos, the company and its partner BrainPad taught the machine learning system to identify excellent ingredients. They then put the system to work searching for visual “anomalies” that might indicate poor potatoes. As a result,

even with potatoes moving at a high speed along a conveyor line, an inspection system with “near-perfect” accuracy was created that eliminated more defective ingredients than people could have. ■



POTATO PROCESSING

INTERNATIONAL

2023 Feature Planning

1 JANUARY/FEBRUARY

Ad closing 16.01/Publishing 27.01



Key Exhibitors Road Map and Event Agenda

Processes

Sorting, Pre-cleaning, Washing, De-stoning
Energy and Water Saving

Expert View

Cutting/Slicing/Dicing
Sustainability in Production

Spotlight

Cleaning and Sanitation

Markets

Western Europe

Products

French Fries in Retail and Foodservice

Ingredients

Batters, Coatings

Storage Special

Refrigeration and Long-term Storage
Sprout Suppressants in Storage

Trade shows: Potato Expo 2023, Fruit Logistica 2023

2 MARCH/APRIL

Ad closing 13.03/Publishing 22.03



Key Exhibitors Road Map and Event Agenda

Processes

Conveying Systems and Belts
Process Monitoring

Expert View

Automation - Ensuring a Reliable and Flexible Production Flow
Drying - Innovation in Belt and Drum Dryers

Spotlight

Smart Production/IoT/Industry 4.0

Markets

North America

Products

Chips and Potato-based Snacks

Ingredients

Established vs. New Flavors

Storage Special

Storage Challenges and Cost-saving Solutions
Storage Design and Construction

Trade shows: World Potato Congress, Interpack 2023

3 MAY/JUNE

Ad closing 08.05/Publishing 19.05



Key Exhibitors Road Map and Event Agenda

Processes

Cutting, Peeling, Slicing
Seasoning & Coating

Expert View

PEF Applications and Advantages
Frying Technologies and Advancements
Optical Sorting - Increasing Yields, Reducing Waste

Spotlight

Alternative Energy & Increasing Efficiency

Markets

Eastern Europe

Products

Hash Browns and Croquettes

Ingredients

Frying Oils

Storage Special

Power Saving and Sustainability
Sensors and Data Gathering

Trade shows: Europatat 2023

4 JULY/AUGUST

Ad closing 17.07/Publishing 28.07

Processes

Blanching, Frying
PEF Systems

Expert View

Cutting Accuracy and Equipment Reliability
IQF Freezing for French Fries

Spotlight

Supply Chain Management & Logistics

Markets

South America

Products

Flakes & Mashed Potatoes

Ingredients

Seasonings for Chips and Fries

Storage Special

Automated Climate Control
Potato Monitoring & Quality Assurance

Trade shows: Potato Association of America Annual Meeting

5 SEPTEMBER/OCTOBER

Ad closing 04.09/Publishing 15.09

Processes

Oil Filtration Systems & De-fattening
Cooling and Freezing
Starch and By-products Processing

Expert View

Remote Maintenance and Customer Service
Complete Lines for Processing
Conveying And Product Transport

Spotlight

The Road to Sustainability

Markets

APAC/ANZAC

Products

Extruded Potato Products

Ingredients

Salt

Storage Special

Disease Management
Handling Potatoes to & from Storage

Trade shows: Potato Europe 2023

6 NOVEMBER/DECEMBER

Ad closing 07.11/Publishing 18.11

Processes

"Forming and Extruding"
Turnkey Projects
Waste Management/Upscaling

Expert View

Batch vs. Continuous Frying
Cutting vs. Hydrocutting
Pulsed Electric Field (PEF) Processing

Spotlight

Increasing Production Capacity

Markets

Global Market Predictions for 2024

Products

Seasoning Trends

Ingredients

Better for you/Clean Label

Storage Special

Store Preparation and Hygiene
Bulk vs. Boxed Storage

Trade shows: British Potato 2023

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