

POTATO PROCESSING

I N T E R N A T I O N A L

Supporting the potato industry worldwide

Issue 4 • Volume 29 • 2021



Process

The Art
of Moving
Potatoes

Interview

SaltMe! Reduced
Sodium Chips
Innovation

Spotlight

Fighting Drought
Conditions in
Potato Crops

Snacks

Post Pandemic
Growth of Batch
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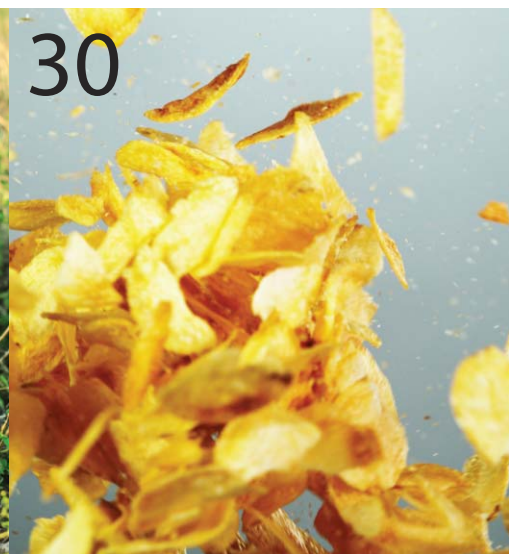
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Smart Solutions and Sustainability

Tudor Vintiloiu - Editor in chief

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With the introduction of Industry 4.0, and smart factories accordingly, there are new opportunities to implement elements of Industry 4.0 in potato processing. Moreover, with the application of Internet of things (IoT), smart control of the process, big data optimization, as well as production monitoring, there is an undeniable opportunity to take huge steps in the way of sustainability and waste reduction.

Modern processing equipment is designed to work in conjunction with different types of digital and analog sensors and systems that transmit data to the control center about product flowing through the line. The system collects and analyzes sensor data to control the line and optimize efficiency while maintaining the ideal product quality and easing operations.

On a sophisticated line that's fully integrated, data collected by the sensors on one machine automatically triggers all the necessary adjustments to other machines on the line without human intervention. For example, if

With the application of Internet of things (IoT), smart control of the process, big data optimization, as well as production monitoring, there is an undeniable opportunity to take huge steps in the way of sustainability and waste reduction.

downstream equipment sends data about changes to product flow, it can trigger upstream gates or diverters on distribution shakers to control feed rates. Integrating the line with a plant-wide network, such as a SCADA or MES system, enables processors to monitor and control the entire line from one location inside the plant as well as remotely on their smartphones and other devices. In the world of post-harvest ag-tech, IoT sensor technology coupled with cloud-based analytics has the power to transform the fresh food supply

chain by improving decision-making at every step and, as a result, dramatically reduce food waste. IoT sensors can transform a supply chain that still operates based on assumptions into one that operates based on the real-time, granular data that provides visibility as to how to truly optimize decision-making. By adopting a data-driven approach enabled by IoT and cloud analytics, growers, processors, distributors and retailers can address the hidden issues currently impacting the fresh food supply chain to reduce waste - and improve food safety and supply chain transparency as well. ●

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Lamb Weston/Meijer to Build New Plant



Lamb Weston/Meijer recently announced their plans to build a new French fry plant, thus expanding its existing production facility in Kruiningen, the Netherlands. The approximately EUR200m investment will increase the capacity of the site by 180,000 MT per year. The new plant is designed to process potatoes with a minimum amount of water and energy, fitting Lamb Weston / Meijer's 2030

Sustainability Agenda. According to a company press release, it is expected to be operational in the first quarter of 2023.

The new production facility enables Lamb Weston / Meijer to meet the global growing demand for frozen potato products. The new plant will be built in addition to the three existing production lines at the location in Kruiningen and will be the most automated plant in the LW/M network.

1,4GROUP Looking to Invest in Louisiana Plant



1,4GROUP, a producer of potato sprout-inhibiting products, is looking at expanding to Louisiana by investing in a new USD35m chemical processing plant. A recent press release announced that the company is considering Ascension Parish, Louisiana, for the future multi-million chemical processing facility. The proposed plant would manufacture two products: an insect repellent and a preservative for potatoes in storage. The company announced that the project would create 34 new direct jobs as well as 126 new indirect jobs. The food preservation company has expanded to offices across North America and in Europe. The Louisiana project would onshore production activity that has been taking place in China.

Morrisons to Close Scottish Potato Depot

Supermarket giant Morrisons, which sources potatoes from 40 growers in Scotland, recently announced the closure of the grading and storage depot at Clayholes Farm near Carnoustie. The company says plans to close its potato grading and storage depot in Carnoustie will not affect its Scottish growers and its commitment to buying Scottish potatoes. It said the announcement, which will result in up to 12 redundancies, was made with "deep regret".



The retailer said "continuing efficiency gains" in its supply chain had resulted in the Clayholes facility only grading 6% of the potatoes it handles, and its role could be absorbed by other parts of the Morrisons supply chain. A Morrisons spokesperson said: "The closure does not mean that Morrisons will be buying any fewer Scottish potatoes, nor is its commitment to Scottish potato growers in any way reduced."

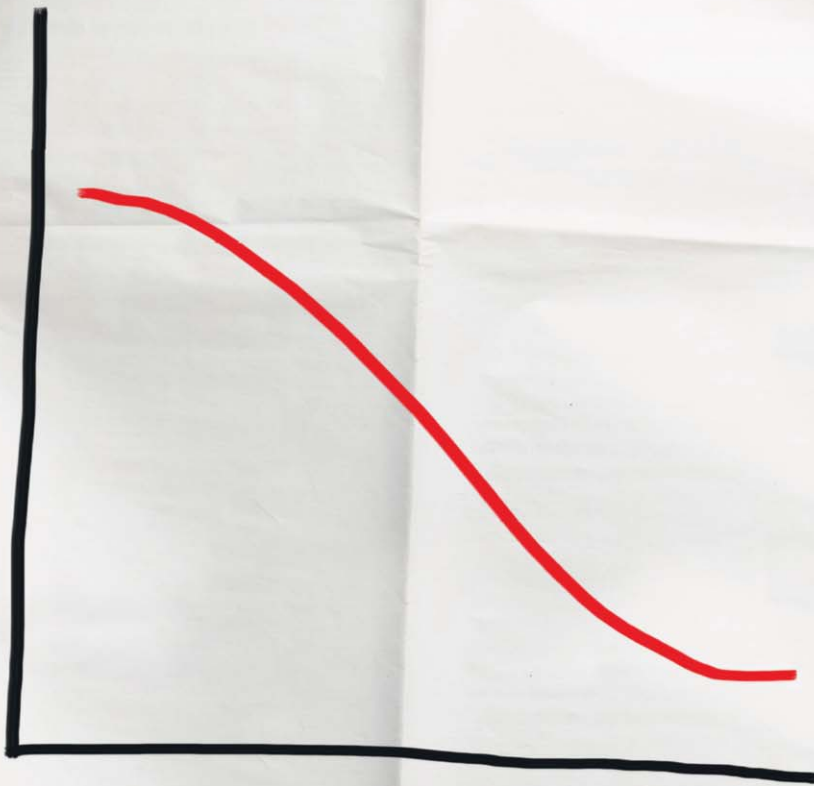
PepsiCo Invests in the Dominican Republic



PepsiCo announced it was consolidating its presence in the Dominican Republic with a recent investment of more than USD30m for the expansion of its Caribbean Plant. Gerardo Díaz de León, president of PepsiCo

Alimentos in Central America, the Caribbean, and the Southern Cone, indicates that the expansion includes the installation of a new potato line capable of producing 10.9 million units of Lay's per month; the fitting out of an exclusive banana line and a new raw material warehouse that doubles the storage space and thereby increases the volume of purchase from local agricultural producers. "It should be noted that, for potatoes, the production rises to 7,000 tons that represent 8% of the total national production of the tuber," Gerardo Díaz de León added.

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NewCold Invests in Australia, Announces Partnership with Simplot

Netherlands-based cold chain logistics company, NewCold, announced that it has signed Simplot

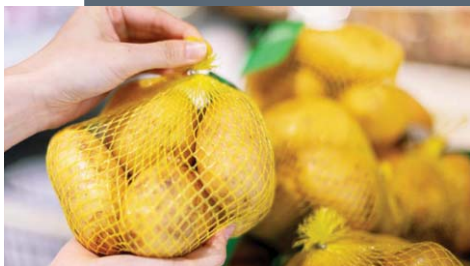
Australia as a new customer and is investing a further USD160m in its Victorian facility, bringing its total investment in Victoria, Australia to USD460m.

NewCold will more than double the

size of its Melbourne 2 facility, providing customers with a powerhouse of advanced features and a seamless experience. At 43 meters high, the site will expand from 115,000 pallet positions to 225,000, an increase of 110,000 pallets. The extension will include 30,000 for ambient/chilled and 85,000 pallet positions for frozen goods.

It will be a one-stop shop facility with ambient, chilled and frozen capabilities, setting new service standards. One of the largest automated high bays in the world, the site also includes a container park. The expanded facility is scheduled to be operational in 2022. Simplot will transition all of its frozen products in 2023.

U.S. Potato Retail Sales See Double-digit Contraction



According to figures from IRI, published by Potatoes USA, sales from April through June this year declined in dollars by 10.5% and in volume by 15.5% compared to the same time period in 2020. Compared with 2019, sales increased in value and volume. Consumers spent USD317m more from April – June 2021 on potatoes than they did in 2019 and bought 53 million more pounds of potatoes, according to IRI. The potato categories that performed best in 2020 showed the largest declines in 2021, IRI said. Canned, dehydrated, fresh, and frozen potatoes all declined by double-digits in both dollars and volume, according to IRI. Within the fresh potato category, medley potatoes maintained positive growth while the rest of the fresh types decreased in sales compared to 2020, according to Potatoes USA.

Tens of Thousands of Hectares with Tubers, Damaged by Storms

The latest Irish Farmers Association (IFA) expert's "Potato Market Update" report estimates the area damaged by the storms

two weeks ago in Belgium, Holland and Germany at around 20,000 ha's. "A full assessment can only be made once the crop reaches maturity, but blight is widespread and tuber quality and yields are very likely to have suffered", the cited document reveals. "Rainfall totals were up to 120 and 150mm in the worst hit areas which included the main early processing area in Germany, Southeastern Holland, East Belgium and Northeastern France. There was an exceptional 200 mm over three days in the center of this block. Some growers have already resigned themselves to serious crop losses", the experts explained.



RNA Breakthrough Creates 50% Increase in Potato, Rice Yields



in initial field tests, adding a gene encoding for a protein called FTO to both rice and potato plants increased their yield by 50%. The plants grew significantly larger, produced longer root systems and were better able to tolerate drought stress. Analysis also showed that the plants had increased their rate of photosynthesis.

"The change really is dramatic," said University of Chicago Professor Chuan He, who together with Guifang Jia at Peking University, led the research. "What's more, it worked with almost every type of plant we tried it with so far, and it's a very simple modification to make."

The researchers are hopeful about the potential of this breakthrough, especially in the face of climate change and other pressures on crop systems worldwide.

Manipulating RNA can allow plants to yield dramatically more crops, as well as increasing drought tolerance, according to research published in Nature Biotechnology. A group of scientists from the University of Chicago, Peking University, and Guizhou University said that,



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Faster Potato Breeding Thanks to Key Gene for Self-compatibility

Researchers at the hybrid potato breeding company Solynta and Wageningen University & Research have identified, cloned and characterized the gene for self-compatibility in potatoes called Sli (S-locus inhibitor). This discovery will have a profound impact on potato breeding. With Sli defined, breeders can implement hybrid breeding, which will

allow for faster and focused rather than opportunistic breeding. This focused breeding can quickly bring new resilient and nutritious varieties to the market that will help make potato production become more sustainable. The result of the team's molecular analysis of Sli has been published in the scientific journal Nature Communications. Ernst-Jan Eggers, genetics researcher

for Solynta explains the company is "already using the Sli gene by crossing self-incompatible diploid lines with a Sli gene donor. With these new insights, we may be able to discover new variants of Sli that could improve our ability to select for improved taste, water use efficiency, disease resistances and other characteristics for our ever-changing world."

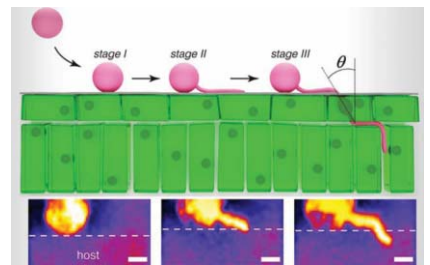
PEI Potato Growers Bet on Mustard and Arugula to Prevent Pests



New research conducted on P.E.I. is using mustard and arugula to tackle pest problems in potato fields with a side benefit, farmers hope, of making the soil healthier at the same time. The mustard in the field is called caliente rojo, and is specially bred to have high levels of glucosinolates, a natural component in many pungent plants including mustard, cabbage, and horseradish. "In conventional mustards, they're bred down so that they're not quite as potent, but this is a variety that is specifically bred to have really high levels of those glucosinolates," said Ryan Barrett, research and agronomy specialist with the P.E.I. Potato Board. "When we incorporate this mustard into the ground as a green manure, it acts as what we call a natural biofumigant," Barrett said. "Through that, we're releasing that chemical into the soil. When it combines with water, it makes a gas, and that gas helps to kill bad microorganisms and diseases in the soil."

Wageningen University Announces Breakthrough in Blight Research

WUR researchers from various disciplines have figured out how the causative agent of potato blight infects a plant and then developed an inexpensive non-toxic substance that acts to protect plants. Experts ranging from cell biologists and physicists to plant disease experts, joined forces and first found out what Phytophthora's main weapon is and then developed a green defensive wall. The research has been published in Nature Microbiology.



"We discovered that Phytophthora uses clever tricks to sharpen its tubular infection structure to then cut through the surface of the plant with a 'sharp knife'. Using this strategy, Phytophthora is able to infect its host, without brute force and with minimal consumption of energy. This is the first time that this mechanism has been uncovered, and really a fundamental discovery," Joris Sprakel, Professor of Physical Chemistry and Soft Matter, said in a press release.

Potato Wastewater Can Feed Recycling Bacteria

New research from Idaho National Laboratory (INL) suggests that potato wastewater might serve well as a low-cost food source for a special bacterium that could be used to recycle high tech devices, industrial catalysts and other sources of rare earth elements.

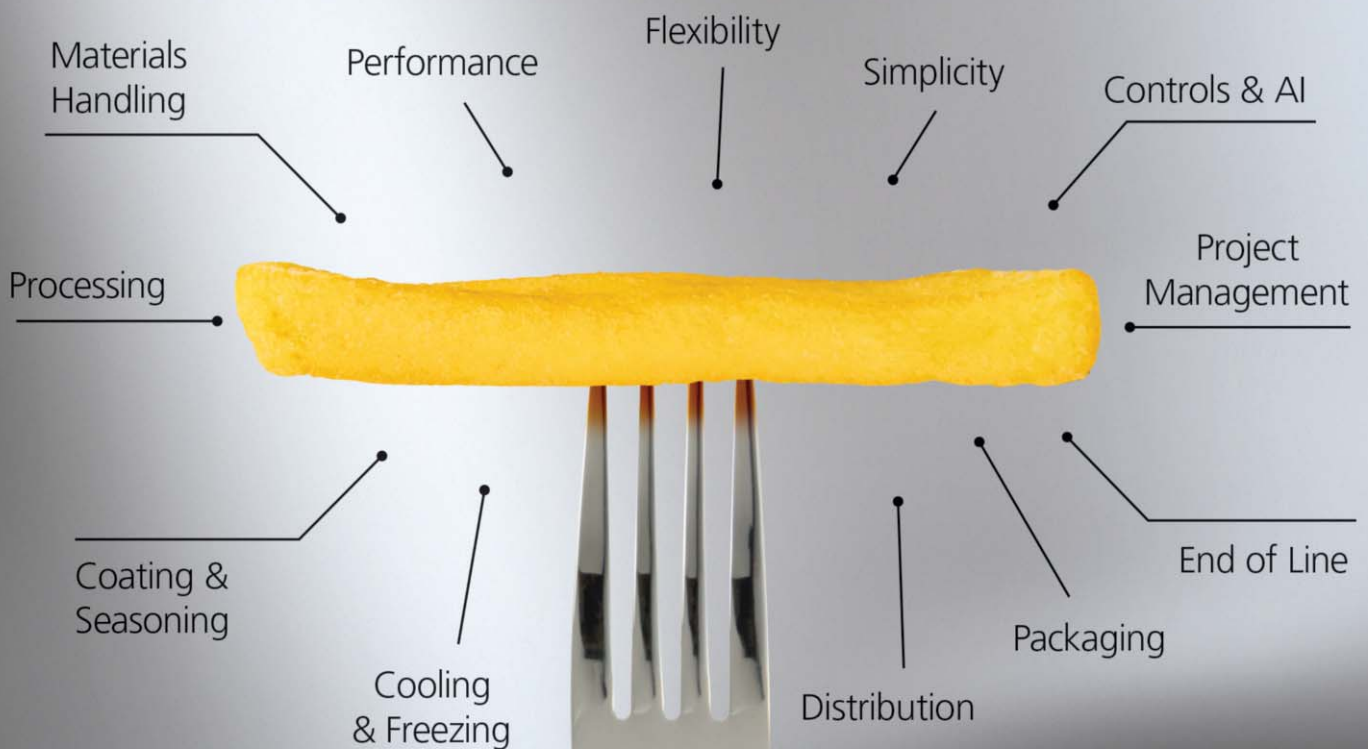
Rare earth elements are a class of metallic elements including neodymium and dysprosium found in everything from cellphones and computers to wind turbines and electric vehicles. These elements are difficult to obtain, leaving U.S. manufacturers vulnerable to supply shortages.

An INL research team has developed an environmentally friendly way to recycle rare



earth elements using a bacterium called *Gluconobacter oxydans*. When provided with nutrients, *Gluconobacter* produces organic acids that dissolve the metallic elements from the surrounding material and pull them into solution - a process called "bioleaching."

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The Art of Moving Potatoes



Transportation of potatoes is generally broken down into three stages: pre-process, during-process, and post-process. In pre-process, most customers transport potatoes by truck, typically in 40-foot enclosed vans. An alternate means is by rail car. Potatoes can be shipped loose in bulk or by placing them in 2,000 – 3,000-pound crates or totes. Transporting potatoes during-process and post-process stages is generally completed by a series of conveyors.

by Tudor Vintiloiu

There are four primary conveyor systems used in potato processing: belt, flume, vibratory, and horizontal motion. Gentle handling is critically important in all stages of potato movement, affecting both yield (e.g., reducing bruising, slivering, breakage, finished product seasoning adherence), as well as finished product quality. At the simplest level, conveyors are designed to connect critical process points within a potato

processing plant, and the best conveyors do so with minimal damage to the product as they move product along as quickly as possible. Beyond that, conveying systems provide key internodal functions such as product accumulation or buffering, metering, overcoming changes in elevation, and dividing product flow to parallel unit operations. The best conveying systems will provide these functions safely and sanitarily without exorbitant cost or maintenance time.

Additionally, innovative conveyor systems providers will use LEAN design principles to reduce the total number of connection points and create the most efficient overall system for their clients.

MOVING POTATOES

Potato processors would typically use as many types of conveyors as there are processing nodes in the product line, as each node will have its own unique requirement for their 'bridging'

conveyor. For example, dirt removal for raw products, de-oiling for fried products, seasoning in kitchen and at the weigher. Depending on how they are shipped (truck vs. rail), different means of unloading can be employed. For example, when shipped loose in bulk, it is common to use a truck dumping system for unloading. In this case, the tractor and trailer are elevated to a 40-degree angle and the potatoes are poured out of the back of the truck. A series of conveyors are used to convey the potatoes into the plant where the potatoes are stored in large bins capable of holding 60,000–90,000 pounds of potatoes per bin. Alternately, the potatoes can be put into crates for longer-term storage. If the potatoes are shipped in crates, a forklift is used to unload the truck and to bring the potatoes into the manufacturing plant.

AVAILABLE SOLUTIONS

Heat and Control is one company that provides solutions for every stage of operation. During the pre-production stage, whether receiving from the traditional crates, totes, and trucks or even bulk rail cars, they have gentle compact handling (Gentle-Flo®) and bin systems to support lines from those focused on a single product to complex multi-product operations. During the processing stage, the company's experts tell us they work with customers to supply the most cost-effective combination of unit operations to accomplish their goals, including, washing, destoning/skimming, sizing, peeler (batch or continuous) Grader-Halver, Pulsed Electric Field (PEF) treatment, slicer infeed and slice washing systems, blanching, and aggressive water reduction technologies. During the post-production or finished product stage, Heat and Control provides one of the industry's gentlest conveying technologies with the combination of their FastBack® Horizontal Motion conveying and Revolution® Proportional Gate system.

VIBRATORY CONVEYORS

In a recent interview for Potato Processing International, Rudy Sanchez, process systems product development manager at **Key Technology** described his company's

best selling potato conveying solutions. "Iso-Flo® is a versatile line of natural frequency vibratory conveyors that maximize sanitation and reliability. We can tune the speed and stroke of Iso-Flo to match the needs of each application so performance is optimized. And it can be fitted with screens, drop-out gates, diverters with side discharges and other features to achieve fines removal, scalping, dewatering, de-oiling, product distribution, aligning, spreading, feeding, collecting, transferring and more," he points out. According to the company, Iso-Flo is designed utilizing a two-mass system that significantly reduces floor vibration loads and is supported on special isolators to minimize any vibrations to the floor, decking or mezzanine. "Our Impulse® vibratory conveyors feature frame-mounted electromagnetic drives. Ideal for scale feeding, ingredient feeding, product mixing, metering from hoppers and more, Impulse starts and stops quickly to achieve precise metering and low maintenance. Impulse shakers utilize sanitary design features similar to

Iso-Flo," Sanchez explains. Key Technology's Marathon vibratory conveyors are used when long conveying distances (up to 30 meters) need to be achieved, and the company recently introduced Marathon with a monobeam drive frame. Similar to Iso-flo with a monobeam drive frame, Monobeam Marathon improves equipment access and enhances sanitation. Zephyr™, introduced in 2020, is Key Technology's newest product handling system. This next-generation horizontal-motion conveyor features a patented counterbalanced direct drive system to gently move fragile product at higher capacities than other horizontal motion conveyors, according to the company. Ideal for frozen bulk potato products, Zephyr minimizes bounce, which reduces product damage, noise and loss of seasoning and other coatings to maintain product quality. "Our sanitary belt conveyors feature a positive drive thermoplastic belt and a tool-less collapsible take-up system, which releases tension from the belt, along with an option for fastener-free carry-ways, which allow the sanitation

“Downtime in manufacturing wreaks havoc on production standards. It’s estimated that almost every factory experiences as much as a 20% loss due to downtime, adding up to thousands of dollars in revenue loss.”

Andreas Hofman, commercial director, EMEA & APAC, Ashworth





“Zephyr is a next-generation horizontal-motion conveyor that features a patented counterbalanced direct drive system to gently move fragile product at higher capacities than other horizontal motion conveyors.”

Rudy Sanchez, process systems product development manager at Key Technology

crew to simply lift the belt up to wash under it,” Sanchez points out.

SPIRAL CONVEYORS

Ashworth is a conveying systems manufacturer with a long tradition in the market, having invented the spiral system in 1967. Andreas Hofman, commercial director, EMEA & APAC, told us how his company’s portfolio and recent innovations help potato processors: “Ashworth’s PosiDrive Spiral® is direct drive spiral solution, with a metal belt. Ashworth designed the PosiDrive Spiral to reduce product movement and eliminate high belt tension caused by oily products. The PosiDrive Spiral is a reliable, durable solution with user-friendly controls to ensure product alignment and positioning for downstream processing. We also

provide ExactaStack® replacement belts for JBT/Frigoscandia self-stacking freezers. Ashworth delivers conveyor belts for direct replacement, also drive components, lubricant, and factory service support. Self-stacking freezers are often used for freezing formed potato products,” he describes. The SmartSpiral® Monitoring System from Ashworth Bros., Inc., is an innovative application that provides real-time remote monitoring of multiple spirals at different locations. Downtime in manufacturing wreaks havoc on production standards. It’s estimated that almost every factory experiences as much as a 20% loss due to downtime, adding up to thousands of dollars in revenue loss, says the company expert. The industry uses a wide variety of conveyor belts made of plastic or metal. Belt selection very

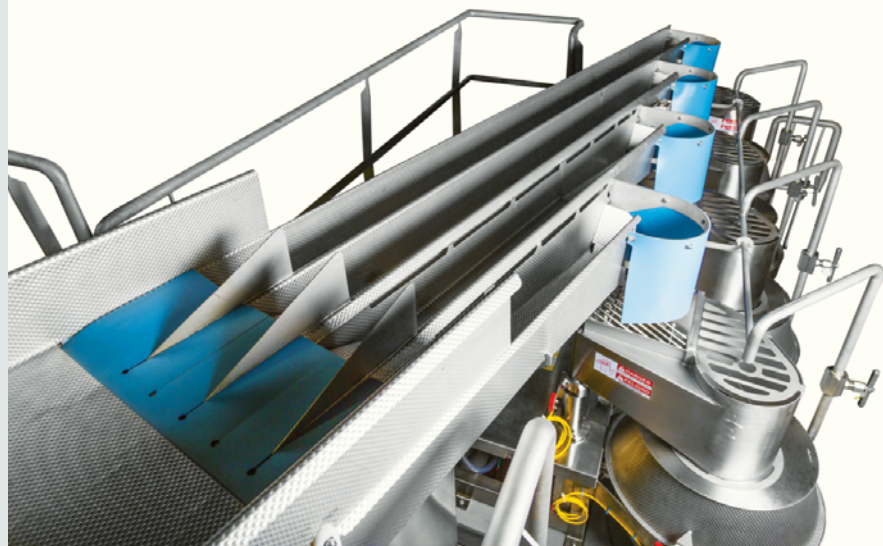
much depends on the production phase concerned, where hygiene standards may also vary. Metal belts are not affected by cleaning agents, high demanding processing environments, and are more robust, and it is often easier to trace, if a (small) piece separates itself from the belt. This is where metal belts clearly distinguish themselves from plastic belts, Hofman reveals. “There are certain company drivers to consider, which - for example - also give directive on recyclability of material used. Here metal belts also offer a clear advantage,” he adds.

CHALLENGES

Different conveyors at every step of a potato processing line each have unique technical challenges. “At receiving, the primary challenge is to

“The most challenging aspect is designing transference systems against limited space constraints, especially because conveyors are typically needed to provide more functionality than basic transference.”

Heat & Control experts



make robust conveyors reliably handle heavy whole potatoes in a dirty environment. Elsewhere, sanitation is a common challenge since it can always be improved upon to better protect food safety. Where conveyors feed digital sorters, ADR systems, fryers, dryers, freezers and other machines, evenly spreading product to maximize the performance of the operation is key, while smooth transitions are important throughout the line," says Key Technology's Sanchez. In general, the conveying challenges potato processors are always working on include improving reliability and maintenance, enhancing sanitation and ease of cleaning, increasing throughputs and maximizing the performance of each application. "At Key, we work very closely with our customers to constantly analyze the challenges they face and create new solutions. This strategy fuels continuous improvement and reflects

our commitment to maintain our leadership position. Our vibratory conveyors have always been recognized for superior sanitation, reliability and performance," Sanchez adds. Heat and Control's experts think the most challenging aspect is designing transference systems against limited space constraints, especially because conveyors are typically needed to provide more functionality than basic transference, a fact which adds to the complexity of their arrangement within tight spaces. With this fact in mind, the second most challenging aspect may be sanitation and maintenance accessibility. The best conveying systems will not only facilitate ease of maintenance access (i.e., access to its component parts) but will not require any preventive maintenance; they would also be designed for wash-and-go or wipe-and-go sanitation, which means that

conveyors and their component parts will resist debris buildup, allowing them to be cleaned in place with little investment of time and effort. Beyond these spatially related challenges, when it comes to conveying systems, potato processors face the challenge of cost constraints, installation timing, and gaining a clear and accurate understanding of all requirements early in the project life cycle. Ashworth's Hofman recalls that challenges are often caused by presence of foreign material, starch, fat, water, high production volumes, and minimum down time available. "Ashworth's metal belts are easy to clean, follow hygienic design principles and are robustly built," says Hofman. The company also offers preventive factory service support (audits), as well as maintenance and cleaning training - two very powerful tools in connection with their data collection (SmartSpiral) solution. •

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Innovations in the Potato Processing Industry

The potato processing market has been steadily increasing in the last years and this trend is expected to continue. Following this growth, many companies working in this field have presented different innovations in the recent years: new storage options, new pretreatments, new fryers, and new cutting systems.

by Emerson Jiménez Barajas, Application Director, FAM & Stumabo International

Precise cutting is an important step for most of the potato processing plants as it is during this step that the shape of the final product is defined. This step has seen some important innovations in the last five years but there are still some challenges that could be addressed in the future.

QUALITY & CAPACITY

The main points that potato processors are looking for are **good quality** and **improved capacity** or **yield**, which are both related. Quality is a somewhat subjective parameter as it depends on the expectations of the processor and the final customer, but there are some elements that define if the quality is good, like the slice thickness consistency, the amount of scrap or off-cuts. It is also a general rule that when the processing line is not producing a

good quality product, the capacity of the line is also affected as more scrap or off-cuts are produced and therefore less final product comes out of the line. Therefore, when a potato processor is working on quality, the yield of the line will also be positively affected. Scrap or off-cuts have a big impact on quality. These are generally small pieces that do not correspond to the quality specifications. They are normally produced because of the shape of the produce, but they are also originated when the produce is not stable during cutting, or when the knife is not stable, or is not sharp anymore. It can also happen when something is obstructing the path between the produce and the knife. FAM and its sister company Stumabo International have been developing new technologies to address these different issues. The patented and patent pending

centrifugal technology was designed to stabilize all the components and the produce during the cutting process. Stability is key in any potato processing facility, especially when the conditions of the produce are constantly changing. Other improvements were done in the materials of the blades to have a more resisting cutting edge that keeps its sharpness longer or that resists better the impact of foreign objects. And finally, it was also important to consider that a stable product and a sharp knife could not work properly if there is something in between affecting the cutting process. Therefore, some features were added to the cutting systems to allow any foreign element to exit the cutting area and reduce any interference between potato and blade. Scrap, off-cuts and slice thickness consistency are also a nuisance for



any post treatment done after cutting. They can block systems, affect fryer stability, oil quality, interfere with heat exchange, reduce hygiene conditions, etc. So, minimizing its production has also benefits for the rest of the processing line, including energy consumption as some of these post treatments require a lot of energy and having a good cutting quality helps reducing the amount of energy required to achieve the process.

CAPACITY & QUALITY

But as mentioned at the beginning, the market of potato processing is growing. Processors require more capacity to keep up with the increasing demand. Cutting faster should not be done at the expense of a reduced quality of the final product. The innovations that FAM and Stumabo International introduced to the potato processing market



take into account this important principle: a **higher capacity with an improved**

quality. This can only be done by a holistic approach of all the elements involved in the cutting process.

For instance, increasing the number of knives will boost the capacity of the cutting equipment, but if the knife is not stable, it also increases the risk of creating more scrap per knife, and accordingly increasing the amount of scrap in total. Therefore, adding knives is only good if the system holding them is also improved.

Reducing downtime is also a way to increase capacity. Prolonging the lifetime of a blade decreases the downtime necessary to change it. Making the change and the setting of the cutting equipment easier and faster also adds to the efficiency of the line.

So, when deciding for a way to increase process quality or capacity, it is important to have a look into all the systems that affect these two parameters. •





Extrusion Equipment Innovations for Potato Snacks

Pelletized snacks are produced when the raw material is extruded into a recognizable shape, this can be done using a process known as direct expansion or alternatively using a process known as indirect expansion.

by Tudor Vintiloiu

The direct expanded pellets are produced in a one step extruder and are ready for consumption following the extrusion process.

The indirect expanded pellets are extruded and then generally sold on as a semi-manufactured product to companies who finish the process by frying them in hot oil then dosing them with flavoring or seasoning before packaging.

According to John Eshelman, director

of Pretzel and Snack Machinery Sales, **Reading Bakery Systems**, extruding systems are classified by their pressure rating: High, medium and low-pressure systems.

High-pressure systems, also known as cooking extruders, operate in the 2,800 psi range. These systems typically process coarse grit ingredients such as corn meal/grits and other added ingredients such as dehydrated potato products resulting in highly expanded snack

products. Medium-pressure systems operate in the 1,200 psi range and are capable of extruding dense low-moisture dough without cooking inherent to the high-pressure extrusion process.

Low-pressure systems operate in the 150 psi range with the main objective being not to change the physical characteristics and properties of the dough during the low-pressure extrusion process.

"RBS low-pressure extruders offer

"RBS has designed their equipment so it is easy to clean and maintain. Our systems are also fully automated with advanced control systems, so they are easy to operate consistently."

John Eshelman, director of Pretzel and Snack Machinery Sales, Reading Bakery Systems



extrusion widths from 380mm to 2000mm to accommodate the nominal widths of customer's tunnel ovens and frying equipment. As customer requirements for efficiency, food safety and employee safety have increased, RBS continues to update our designs. The Low Pressure Extruder was recently redesigned to be safer, more efficient and easier to clean. The features of the redesigned LP Extruder include augers that deliver more product flow with less work to the product; new lightweight, seamless, single-piece hoppers that eliminate harborage areas; pre-feed rolls made of plastics that are safe for food processing; an improved cutting mechanism with a longer service life; improved guarding for increased safety; and a band-cutter cam that is positioned away from the product zone to reduce contamination and provide easier maintenance access," Eshelman explains.

GEA is another leading equipment manufacturer that has recently rounded out its xTru Twin series of high-capacity extruders with the flagship xTru Twin 140. The new top-of-the-range machine is equipped with an advanced profile; powered screws provide users up to 40% increased capacity with the same efficiency, quality and footprint as previous models. Additionally, this high-capacity technology can be applied to the other models of the GEA xTru Twin extruders too – models 70/92/112 – and retrofitted to older machines to increase their capacity without changing the floorplan of the factory.

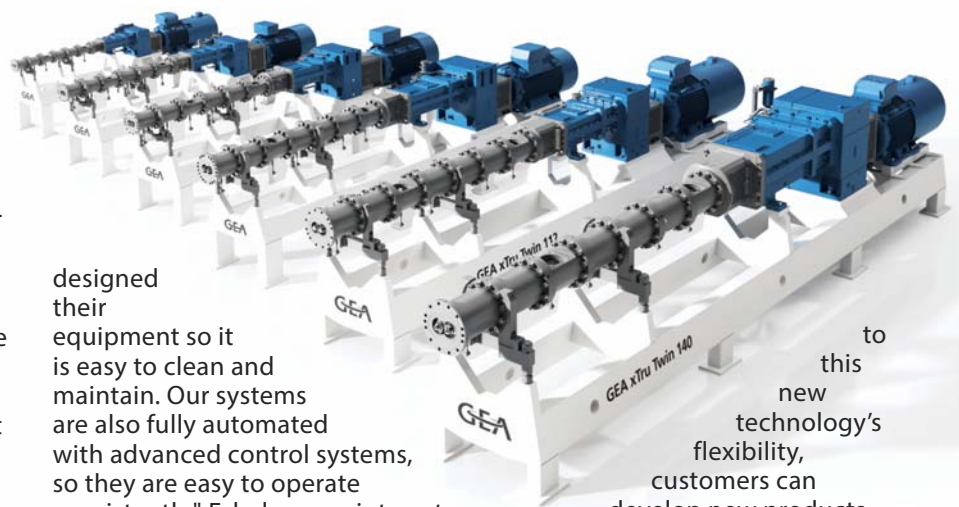
The GEA xTru Twin extruders offer the flexibility to produce a wide range of products and the latest xTru Twin 140 has a production capacity of over 3 tons of pellets and 10 tons of pet food kibbles an hour.

OVERCOMING CHALLENGES

According to the RBS specialist, changing of dies and cleaning of equipment is often an issue with both high pressure extrusion and low pressure extrusion. "RBS has

"To achieve the additional capacity GEA engineers have used their experience and know-how to increase the cross-sectional area, rotation speed and pitch of the screws on the new machines while maintaining the extruder footprint and screw length."

GEA specialists



designed their equipment so it is easy to clean and maintain. Our systems are also fully automated with advanced control systems, so they are easy to operate consistently," Eshelman points out. The flexible design of the RBS High Pressure, single screw Extruder enables quick and easy changeover of the screws, barrels and product dies. This allows for a wide variety of products with interesting textures and flavors in different shapes. "With the RBS Low Pressure (LP) Extruder Product, changeover is as simple as exchanging one compression head and die for another one with a different shape. This takes just minutes and enables consistent and accurate production of a wide array of products including hard pretzel shapes, sticks, braids, sushki and co-extruded products," he adds.

UPDATED DESIGN

GEA embarked on the process of developing the new technology in response to customers' requests and the market's need for a single, high-capacity machine capable of producing a wide range of innovative food shapes, according to a company press release. Thanks

to this new technology's flexibility, customers can develop new products and get them to market quickly and profitably, the company says.

"To achieve the additional capacity GEA engineers have used their experience and know-how to increase the cross-sectional area, rotation speed and pitch of the screws on the new machines while maintaining the extruder footprint and screw length. This also allows customers to upgrade existing machines without buying a new one or changing the plant layout." Other key features of the GEA xTru Twin range include: A high-speed premixer for perfectly hydrating flour; a large, curved mixing vessel that facilitates good water absorption and adhering to the requisite hygiene standards; a vertical forced feeding screw to control the dough's movement into the cooking screw; a powerful, variable speed motor with a safety clutch; a high-torque, double cascade gearbox that ensures excellent power reserves and safety. •

Fighting Drought Conditions in Potato Crops

The potato plant is often considered as a drought-sensitive crop and its sustainable production is threatened due to frequent drought episodes. There has been much research aiming to understand the physiological, biochemical, and genetic basis of drought tolerance in potato as a basis for improving production under drought conditions.

by Tudor Vintiloiu

Climate change is expected to exacerbate drought events throughout the world, resulting in large-scale ecosystem alteration and failure of drought-sensitive crops. In addition, periods of drought vary from year to year in severity and length, making it difficult for plants to adapt to more severe conditions.

Potatoes are seen as a cool weather crop that require about an inch of water a week to produce the highest possible yield. There are two main reasons that potatoes are more sensitive to water stress than most other crops:

- A shallow root system: Potatoes have a relatively shallow root system with most of the roots in the top 12 inches of soil.
- Soil type: potatoes do well in sands and sandy loams, soils that have low to medium water-holding capacity.

High yields of high-quality potatoes can only be achieved by maintaining high levels of available soil moisture throughout the growing season. Without regular rainfall, frequent irrigation is necessary. Soil moisture becomes critical when the available soil water drops below 60-65%. The impact of water stress will depend on the severity, timing and duration of moisture stress.

MODERN MONITORING TOOLS

One of the ways in which farmers can assess the heat stress levels of the plants so that timely decisions can be made is through the use of drone imaging. The most common role of drones in agriculture is as remote sensing platforms to assess and monitor crops, but emerging agricultural applications include precision distribution of chemicals and biological control agents. By implementing drone technology, farms and agriculture businesses can improve crop yields, save time, and make land management decisions that will improve long-term success. One of the great advantages of drone technology is the effectiveness of large-scale crop and acreage monitoring. Today, growers can not only obtain real-time footage but also

“Acting directly as an anti-oxidant, it can help to counter reactive oxygen species (ROS – free radicals) that can cause significant damage, particularly within the foliage if leaves get too hot.”

Dave King, Syngenta’s head of technical

time-based animations, which can illuminate crop progression in real-time. With drone mapping and surveying, technology decisions can now be made based on real-time data, not outdated imagery, or best-practice guesswork. With near infrared (NIR) drone sensors, farmers can actually determine plant health based upon light absorption, giving invaluable insight of the overall farm health. Such tools make it easy to collect information like overall crop and plant health, land distribution based on crop type, crop life cycle, and detailed GPS maps of current crop area.

AI SOFTWARE TOOL

Crop4Sight recently announced the release of its easy to use potato irrigation-scheduling tool. The new tool uses a state-of-the-art potato specific water balance model. The tool delivers convenient irrigation schedules whenever a grower requires them. If the weather or irrigation equipment availability changes, an updated schedule can be produced at the click of a button for each crop.

Using tailored soil type, variety information and the farm irrigation capabilities, Crop4Sight creates crop specific irrigation schedules, for the week ahead. It lets the grower choose whether they want to irrigate for scab control, yield or set their own soil moisture deficit (SMD), and the tool uses all of this, and more, to calculate water balance, creating a schedule bespoke to grower priorities. Hourly meteorological data for including evapo-transpiration (ET), wind speed, relative humidity and rainfall are automatically pulled in for each crop. The tool even calculates the rainfall to keep water balance more accurate if there hasn't been time to read the rain gauge at the field. "The module is integrated with Crop4Sight's crop monitoring and yield forecasting tools and uses the same in-season data making it work harder for you," says Dr. Robert Allen, responsible for the technical strategy and product delivery at Crop4Sight. "Using this data the scheduled irrigation accounts for crop growth stage, soil moisture and environmental conditions. This allows

"Using this data the scheduled irrigation accounts for crop growth stage, soil moisture and environmental conditions. This allows growers to efficiently manage soil moisture so that crop yield is not restricted, and water is not lost to drainage and wasted."

Robert Allen, technical strategy and product delivery, Crop4Sight

growers to efficiently manage soil moisture so that crop yield is not restricted, while at the same time scheduling so that water is not lost to drainage and wasted.

BIOSTIMULANTS

Growers without access to irrigation systems are being encouraged to follow the lead of one Lincolnshire farmer who has embraced seaweed to help his crop fend off the effects of heat stress.

Since 2018, the Louth Potato Company has used a seaweed-based biostimulant to counter the impact of extreme weather conditions. Ryan Wrisdale has been applying **Algifol** regularly to his winter wheat, pumpkins, and potatoes. He says the results have been noteworthy.

"In 2018, we had a very wet winter and spring, followed by drought conditions over the summer. As we don't have an irrigation system, we could not water our 20-acre crop of early and second early potatoes. After a few weeks, the plants were suffering from stress due to no water and were not growing. We were introduced to Algifol, which we applied with every

blight spray on a seven-day interval. This meant that the plant was fed through the leaves with Algifol applied little and often. This kept the plant alive, and the potatoes were able to gain more weight and size, resulting in a bonus of an increased yield after we thought it was too late. We also gained a good-sized potato, which was amazing as at one point we thought we were going to have a disastrous crop. The potato crop yield averaged between seven and ten tons to the acre that year."

Today, the Louth Potato Company is so happy with the results Algifol produces; the company uses it on all of its crops. The biostimulant is manufactured by NeoMed-Pharma in Germany using seaweed gathered from the North Atlantic. The seaweed is dried and refined to maximize its wealth of trace elements, vitamins, enzymes, amino acids, carbohydrates, polyuronides and growth-regulating plant hormones.

Syngenta UK is another company that has recently launched its first biostimulant in potatoes, Quantis, that has shown to effectively help crops cope with the impact of heat





stress. The company said that it had carried out “the UK’s most extensive research field trial of a biostimulant”. Analysis of the data resource had revealed “significantly increased yield for crops that had been under prolonged or extreme heat stress”. The results indicated that Quantis could have an important role in potato agronomy programs from tuber initiation, through the crop bulking phase, Syngenta outlined. Syngenta’s head of technical Dave King said that the value of Quantis was even more apparent with the increasing incidence and severity of heat events in the UK. King explained that Quantis delivered a blend of organic carbon, amino acids, potassium and calcium to supplement the plant’s own molecular cell function. “Acting directly as an anti-oxidant, it can help to counter reactive oxygen species (ROS – free radicals) that can cause significant damage, particularly within the foliage if leaves get too hot,” said King. “It is believed to activate and enhance the potato plant’s natural capability to adapt to heat stress, to prevent damage.” He said that Quantis had a relatively high proportion of short chain carbon

molecules, which are particularly effective at helping the plant to prevent the creation of ROS during periods of stress. Furthermore, it helps with the scavenging of accumulated ROS, to minimize their adverse effects. “By filling the organic carbon gap when a plant comes under stress it can act to minimize its effects,” he confirmed. Quantis also contains a level of amino acids that can help to protect plant structures from nitrogen and protein degradation when under stress. Furthermore, Quantis also provides osmoprotectant regulators to help plants manage cell osmosis, which could help contribute to the heat stress mitigation.

GENETIC TOOLS

According to experts, drought first causes stomatal closure, reducing CO₂ uptake for photosynthesis, reducing plant growth and yield. Plants vary in the types and speed of responses to drought conditions, depending on their genetic and ecotypic backgrounds, but a number of drought responsive genes are conserved across plant taxa, especially genes involved in osmotic adjustment, detoxification, and cell communication and signaling.

A new type of potato, however, is designed to warn farmers by fluorescing at the earliest stages of stress. The experimental genetically engineered potato plant was developed by scientists at the Hebrew University of Jerusalem, led by Dr. Shilo Rosenwaser. They chose to modify the *Solanum tuberosum* potato as it’s a major food crop throughout much of the world. The researchers introduced a new gene into the plant’s chloroplasts, which are organelles (subcellular structures) that conduct photosynthesis. That gene expresses a fluorescent protein in response to the presence of reactive oxygen species – these are highly reactive chemical molecules that are produced in order to help mitigate stress, although they can also harm the plant if they build up in its cells. Putting it simply, the more stress that a plant experiences, the greater the amount of reactive oxygen species it produces. In the case of the new potato, this in turn causes it to produce more of the fluorescent protein – so the more stressed the plant is, the brighter its fluorescent glow. And although the fluorescence can’t be seen by the naked eye, the scientists could detect it using a highly sensitive fluorescent camera. “We were able to monitor the fluorescence signals emitted from the biosensors and noticed the accumulation of reactive oxygen species during the early phase responses to stress conditions such as drought, extreme temperature, and high light,” says Rosenwaser. The team now plans on developing the concept further, and even to apply it to other crops. ●

“We were able to monitor the fluorescence signals emitted from the biosensors and noticed the accumulation of reactive oxygen species during the early phase responses to stress conditions such as drought, extreme temperature, and high light.”

Dr. Shilo Rosenwaser, Hebrew University of Jerusalem





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SaltMe!

Reduced Sodium Chips Innovation

Victor Hugo Manzanilla, CEO of Microsalt and SaltMe! - a new snack brand, which delivers a full flavor chip with 50% less sodium, told Potato Processing International about the breakthrough technology, which has created the world's smallest grain of salt. MicroSalt's large surface area compared to its size triggers a psychological factor in taste where the faster something dissolves on the tongue, the stronger its taste is perceived by the brain. This allows you to reduce sodium intake by 50% while still maintaining full flavor.



Please tell us about SaltMe! potato chips and the main drivers behind bringing this product to market.

Our goal in developing SaltMe! was to create a full flavor potato chip with 50% less sodium. Traditionally, reduced salt potato chips end up tasting bland or lacking, so we developed a healthier alternative that tastes identical to big name competitors. We also saw a whitespace opportunity for a brand to own the low sodium niche. Every other brand that had a low sodium option, they lacked flavor or it was a small line-extension of the overall brand. We decided to own that space with SaltMe! SaltMe! Chips were developed by Microsalt Inc., they are non-GMO, kosher and gluten-free and come in four different flavors: Original, Barbecue, Cheddar and Sour Cream, Sour Cream and Onion.

Please describe the NPD process and the challenges you had to overcome in developing this product.

Our initial ambition was to create a classic style potato chip with SaltMe!, in order to showcase Microsalt's patented technology. Applying Microsalt® to potato chips was not an issue. The biggest challenge was to truly deliver the full flavor promise with 50% less sodium. In order to achieve that, we had to go through a process of trial and error in order to succeed. We were able to prove parity flavor (but 50% less sodium) vs. the leading potato chip makers via a test led by the New York Sensory Institute.

Please discuss the market for this product and how the growing health trend plays into it. How did the COVID-19 pandemic influence consumer demand?

Our mission at MicroSalt® and SaltMe! Chips is to develop food technology solutions that empower people to live healthy lives. While sales of processed snack foods went up during the pandemic, this past year has also

“The micro-sized particles of MicroSalt® are approximately 100x smaller and taste much saltier than typical salt crystals as well as being free from any substitutes or bitter aftertaste. This allows consumers to reduce their sodium intake by half, without compromising on flavor.”

Victor Hugo Manzanilla, CEO of Microsalt and SaltMe!



highlighted the need for health conscious alternatives. Salt is a contributing factor to hypertension, which if left untreated can lead to heart disease, a leading cause of death in the United States. With health a major topic of focus after the pandemic, overconsumption of salt is becoming an issue for consumers, doctors and regulators alike.

Tell us about Microsalt and how this innovation differs from other sodium-reducing solutions.

The micro-sized particles of

MicroSalt® are approximately 100x smaller and taste much saltier than typical salt crystals as well as being free from any substitutes or bitter aftertaste. This allows consumers to reduce their sodium intake by half, without compromising on flavor. Unlike competitors, MicroSalt® is not a salt alternative like potassium chloride, which often tastes bitter or metallic, it is a true non-gmo and kosher salt. Microsalt's fast dissolving salt crystals produce an intense sensation of saltiness in the brain. MicroSalt® maintains great flavor

SaltMe! Chips come in four different flavors:

- Original
- Barbecue
- Cheddar and Sour Cream
- Sour Cream and Onion



HOW IS IT POSSIBLE?

SaltMe! Chips was created by MicroSalt®, a food tech company who developed a patented technology in salt production.

The fast-dissolving salt crystals used in SaltMe! Chips can **produce an intense sensation of saltiness with 50% less sodium.**

The micro-sized particles of MicroSalt® are **100x smaller and taste 20% saltier** than typical salt crystals, **free from any substitutes or bitter aftertaste.**



DID YOU KNOW...



Heart disease is the leading cause of death around the world.



71% from snacks

According to the Center for Disease Control (CDC), **Americans get 71% of their daily sodium from processed, snacks and restaurant foods.** Those who consume higher amounts of sodium are at risk for developing high blood pressure that can cause a heart attack or stroke.



48% more salt

Average daily sodium consumption in America is around 3,400 mg while federal guidelines, such as the 2015-2020 Dietary Guidelines, **recommend less than 2,300 mg for the general population.**



92,000 lives

The American Heart Association estimates that reducing current sodium intake by 1,200 milligrams a day **can prevent between 44,000 and 92,000 deaths per year** and save between \$10 billion and \$24 billion annually in healthcare costs.

“The benefit of the micro-sized crystals is that they dissolve virtually immediately as they touch your tongue, delivering a perceived preakness of saltiness with much less sodium. In comparison, regular table salt dissolves much slower, making you consume salt that is never tasted.”

Victor Hugo Manzanilla, CEO of Microsalt and SaltMe!

while also allowing you to use less salt and sodium to get the same level of saltiness.

The benefit of the micro-sized crystals is that they dissolve virtually immediately as they touch your tongue, delivering a perceived preakness of saltiness with much less sodium. In comparison, regular table salt dissolves much slower, making you consume salt that is never tasted. The company is aspiring to become the leading provider of low sodium salt in the world.

What are the modifications in seasoning application equipment that a processor has to do, in order to use this type of salt for potato chips?

No change is needed to apply MicroSalt® to potato chips. MicroSalt® is applied using the same equipment used for any other seasoning. Also, due to the micro-sized particles, MicroSalt® attaches much better to surfaces, so it can be used in both cold and warm chip surfaces.

How do such small particles adhere to the product and how do you minimize waste during production?

Due to the weight and size of the micro-sized crystals, the electrostatic forces work in our favor, eliminating the waste due to precipitation. The adhesion power of Microsalt® is unparalleled to any other salt substitute in the market. Because of this, snacks manufacturers can rest assured that the flavor profile stays consistent during the whole distribution and sales process.

What has been the consumer feedback to your product? What about retailers?

Virtually every feedback we have received is that SaltMe! Chips are indistinguishable from other big brand name alternatives. We have been highly rated in Amazon (4.3+ stars) and selected as Amazon choice for low sodium snacks in the past 4 months. Additionally, our retail business has been growing consistently adding more stores every month. •



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NA Potato Processing Market Set to Reach USD7.2bn by 2026

North America Potato Processing Market was worth USD 5.6bn in 2021 and estimated to be growing at a CAGR of 5.36%, to reach USD7.2bn by 2026.

According to a market report by **Market Data Forecast**, it is estimated that less than 50% of potatoes grown worldwide are consumed fresh. The rest is processed into potato food ingredients and food products; fed to cattle, chickens, and pigs, processed into starch for industry; and re-used as seed tubers for producing the next season's potato crop. But the trend of North American consumption of potatoes as food is shifting from fresh potatoes to processed, added-value, food products. One of the key items in that category is frozen potatoes, which includes most of the French-fries served in fast-food chains and

restaurants worldwide. The world's appetite for factory-made French-fries has been put at more than seven million tons a year. Another processed product, the potato chip is the long-standing king of snack foods in a lot of developed countries, while dehydrated potato flakes are used in retail mashed potato products, as ingredients in snacks, also as food aid. According to the same report, the driving factors of the North America Potato Processing market are growth in demand for applications such as prepared ready meals and snack foods and the growth in consumer preferences for convenience foods to save efforts and time. The rise in the number of retail channels such as

supermarkets and hypermarkets, the quick growth of the fast-food industry, industrialization policies adopted by governments of developing economies are also expected to propel the growth of the potato processing market during the forecast period.

The market is divided based on geography into the United States, Canada, and Mexico. North America has the second-largest market for potato processing in the world by share. In the North American region, the United States has the largest share while Canada is expected to grow at the highest CAGR. According to a market report issued by **Potatoes USA**, the potato

categories that performed best in 2020 in the US, showed the largest declines in 2021. Canned, dehydrated, fresh, and frozen potatoes all declined by double-digits in both dollars and volume. Sales of deli-prepared sides increased in dollars by 23.9% and in volume by 20.4% from the same timeframe in 2020. The majority of salad bars, which largely drive sales for this category, were not brought back into grocery stores until early 2021. Increased growth of this category shows the reopening of salad bars and a more mobile consumer base. Research concludes that growing demand of snack food like potato chips and increasing trade of frozen potato items are some factors driving the growth of the market. Moreover, the increasing popularity of ready to eat food along with an increase in supply chain activities and rapid growth in fast-food sector are set to further boost the growth of this market. Increasing convenience diets among consumers and growing health concerns such as obesity & diabetes are some other factors to consider that influence the dynamics of the market. Moreover, rise in the living standards, easy product availability and attractive packaging further contributing to its growth. At the same time, research shows that health concerns as well as the high

cost for storage and transportation, which increases the investment requirement, are two of the main factors that can have a negative impact on the market.

US OUTLOOK

Potato production in the United States is expected to fall 5.7% compared to last year with the largest impact being felt in the French fry industry, according to a report by **North American Potato Market News (NAPM)**. The table and dehydrated markets will be spared, while chip potato storage supplies may be eroded.

As the COVID-19 pandemic descended upon North America, fryers expected it would significantly reduce demand for French fries so they released a substantial portion of their previous year storage contracts. This lowered processing contract volumes by 15% to 20%.

“Though the mix of products has changed with the pandemic, overall demand for finished product is now running close to year-earlier levels. That is leaving fryers short of raw product,” the report says. Processors were expecting growers to plant more open processing potato varieties - which didn't happen. The most likely source of open processing potatoes is the Idaho table potatoes sector which is still close to 50% Russet Burbank potatoes, the report

5.36%

is the estimated CAGR of the processed potato market by 2026.

23.9%

in dollars and 20.4% in volume was the increase in sales of deli-prepared sides compared to 2020.

notes. Fryers will need to pull three to five million cwt of potatoes away from the table potato market. In the chip market, NAPM is expecting fryers will bid on any open potatoes that might exist, limiting supplies available to the chip potato industry. •



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Jonathan Thomas

Post Pandemic Growth of Batch Fried Chips

Potato-based chips continue to represent one of the most popular forms of snack food across the world, despite ongoing health concerns over calories, fat and salt levels, etc. In-home snacking and interest in bolder flavors is set to keep demand for kettle chips high over the next few years.

by **Jonathan Thomas**

During the first decade of the new millennium, one of the leading trends within western markets such as the UK was the growing popularity of premium and gourmet products, which were often promoted using terms such as 'hand-cooked.' Consumers were increasingly attracted to the unusual texture and appearance of these products, while manufacturers sought to increase their appeal still further via the launch of novel flavors. This trend towards gourmet snacks was responsible for much of the growth in demand for batch-fried chips, or kettle chips as

they tend to be more widely known. The main difference between batch-fried chips and their more regular alternatives lies in their cooking methods. Regular potato chips are manufactured via a process termed 'continuous fry', i.e. being fried on a conveyor belt as they move through hot oil which remains at a constant temperature. In contrast, a process known as batch cooking is used for batch-fried or kettle chips, which has been described as a more old-fashioned cooking method and results in products which are harder and crunchier than standard varieties. This process involves stirring cold

potatoes into an oil-filled kettle. The temperature decreases as more potatoes enter the kettle, thereby slowing down the cooking time. This creates chips with a darker color and unusual and imperfect shapes. The batch-frying process does create some specific challenges for manufacturers. The direct slicing process used results in significant quantities of starch being washed off the potatoes in the frying oil. This water-soluble starch is cooked in the oil and assumes the same density, with the result that it cannot be removed from the oil by a centrifugal type of separator. The starches will also bind

the surface of the filter modules, thereby reducing their lifespan. The batch-frying process can also result in heat damage to the oil. This is because the temperature fluctuations associated with kettle chips are more damaging to oil than processes which involve a more constant temperature. Kettle-style potato chips tend to absorb up to 35% of the frying oil, which is slightly lower than regular varieties produced via a continuous system. The batch-style process also increases the possibility of accumulations of solids and metals from the foods being fried, a factor which can also have a negative effect upon the lifespan of manufacturing products. Much of the difference between kettle chips and their more regular counterparts revolves around their appearance and their texture. Kettle chips tend to be thicker than regular varieties, while the fact that their sides often flip up results in a crunchier experience for consumers. In terms of health and nutritional credentials, the two types are broadly similar, since an examination of many of the leading varieties available indicates that calories and total fats per serving are comparable. However, manufacturers of kettle chips do appear to be making some concession to consumer health concerns, since the market contains varieties promoted on a low salt/sodium platform, as well as kettle chips cooked in healthier oils. One relatively common complaint regarding kettle chips is their overly greasy texture and mouthfeel, while other consumers are not overly keen on their hard edges. A range of different oils are used by the world's manufacturers of potato crisps and chips. Within the kettle chips sector, olive oils appear to be a favored option, especially amongst companies that compete within the organic foods market. Other examples include sunflower oil, canola oil (which is often used in fat-free products) and peanut and avocado oil – both the latter varieties are viewed as intrinsically healthy on account of their high monounsaturated fat content, while they can also enhance the flavor of the end-product.

“Much of the difference between kettle chips and their more regular counterparts revolves around their appearance and their texture.”

MARKET TRENDS & CONSUMPTION

Although the sector continues to face strong pressure from the health lobby, potato chips and crisps still represent one of the mainstays of the global snack foods market. In many western markets, the adult snacking sector has demonstrated strong growth in recent years, with growth within this sector having outperformed the overall market in many instances. One effect of this trend has been the development of more premium and luxury chips and crisps to cater towards more demanding tastes, incorporating new flavors, tastes, textures, etc. This has helped to increase demand for batch fried chips and crisps, which are most often positioned towards the premium end of the market. In many western markets, sales of snack foods such as kettle chips benefited from the lockdown measures imposed to curb the spread of Covid-19. The frequency of in-home snacking increased, as people's movements were more restricted, with products such as kettle chips increasingly viewed as an affordable treat or indulgence. Furthermore, eating snacks came to be seen as a way of relieving

boredom by many consumers, as well as a source of escapism. These sentiments were expressed in the latest edition of the State of Snacking study published by Mondelez International in 2020. This survey (which canvassed the opinions of almost 6,300 people) found that over half (52%) considered snack foods to be something of a lifeline during the pandemic and the lockdown measures introduced to curb its spread. In addition, a sizeable 88% of respondents felt that they were snacking either more frequently or around the same compared with periods prior to the pandemic. According to research from the Oral Health Foundation, staying at home led to 38% of UK consumers increasing the number of times with which they snacked throughout the day. This trend was most evident amongst younger consumers and families – for example, 61% of those aged 35 and under admitted to eating more between meals. This was also true for 70% of households containing children aged under five. In the US, meanwhile, research carried out by companies such as YouGov highlighted strong growth in demand for kettle chips packaged in larger formats, typically between 10oz and





In many western markets, sales of snack foods such as kettle chips benefited from the lockdown measures imposed to curb the spread of Covid-19.

16oz. Part of this was undoubtedly caused by their suitability as an accompaniment for in-home entertainment occasions when they could be shared with family members or friends.

Across parts of the world, the market for potato chips and crisps continues to witness the emergence of bolder flavors, to meet consumer demand for innovative and interesting tastes. It has been suggested that much of this has been driven by Covid-19 and enforced lockdown periods over the last 18 months, with consumers in many regions unable to visit their favorite restaurants and foodservice establishments.

In the US market, spicy flavors represent one of the fastest growth areas – according to the latest version of PepsiCo's Frito-Lay US Snack Index (which surveys almost 2,200 adults), 32% of consumers were actively seeking out new, spicy and bolder flavors in 2021, up from 25% the previous year. This figure increases to

45% for millennials and those belonging to the Generation Z age group. Some of the regional flavors in vogue with US consumers at present include Asian (e.g. Japanese, Thai and Korean), as well as Mexican and smoke flavorings associated with southern cooking styles.

This penchant for bolder flavors has been apparent within the kettle chips sector. A recent addition to the Kettle range in the UK was a Steakhouse Barbecue flavor, which was launched to meet the rising consumer demand for snacks flavored with seasonings based on barbecued meat – this sector has risen by 21% within the last year for sharing chips.

Another trend evident within the category has been the emergence of flavors based on heritage or nostalgia for comfort foods in these stressful times. In late 2020, the Kettle range in the UK was extended with new 'Tastes of Britain' flavors, which played upon the enduring popularity of meals associated with happier times. Flavors

in the range included Seaside Salt & Malt Vinegar, Sunday Lunch Roast Chicken & Thyme and Gardeners' Classic Rosemary & Sea Salt. In a similar vein, the Cape Cod range in the US market was extended recently with a new Summer limited edition, with a flavor based on lemon and cracked black pepper.

Looking ahead, future demand for snacks such as kettle chips is likely to be driven by the increasing tendency of consumers (especially from the younger age groups) to eschew formal meals in favor of snacks. With more people expected to work from home for at least some of the week, the trend towards irregular eating of smaller meals is expected to grow in significance – according to the Mondelez study mentioned earlier, almost two-thirds (64%) of respondents plan to continue eating several smaller meals over the course of a typical day (rather than three main meals) in the post-pandemic world. The study also revealed that more people are turning to snack foods to 'get through the day' and to help confront difficult everyday situations.

INDUSTRY SUPPLY

The most well-known supplier of batch-fried or kettle chips in the world is the appropriately named Kettle Chips. In the autumn of 2019, the company's operations in the UK, Europe and the Middle East were sold to Valeo Foods for GBP66m. The deal also included the Dutch-based sister company Yellow Chips, which manufactures batch-cooked natural crunchy chips. The company's Kettle crisps have been manufactured in the UK at its Norfolk site since 1988, while it accounts for a leading 40% of the premium crisps segment. In the US, meanwhile, the Kettle brand remains part of Campbell Soup Company,

where it accounts for 3% of the local market for potato chips. Campbell Soup Company's snacks division accounted for almost half of its total revenue within the last fiscal year. In addition to Kettle, the company's range also includes Cape Cod, which claims leadership of the US market for kettle chips and has 4% of the total potato chips category. According to recent data from Statista, almost 1.7 million US consumers ate eight or more bags of Cape Cod chips during 2020. The Cape Cod brand is available in varieties such as Classic, Less Fat, Waves and Waffle Cut. Also present in the US market is PepsiCo, via Lay's Kettle Cooked – according to PepsiCo, these are made in small batches using a unique cooking process which creates an extra-crunchy finished product. Lay's Kettle Cooked chips contain 150 calories per serving and 9g of total fat, while they tend to be thicker and browner than their regular Lay's counterparts. Flavors in the range

Across parts of the world, the market for potato chips and crisps continues to witness the emergence of bolder flavors, to meet consumer demand for innovative and interesting tastes.

include Original, Jalapeno, Maui Onion, Flamin' Hot, Mesquite BBQ and Sea Salt & Cracked Black Pepper, as well as a variety made with 40% less fat and Lightly Salted Kettle Chips, which contain lower levels of sodium. Another US-based manufacturer worthy of mention is Utz Brands, which produces a range of leading savory snack brands. Its Utz range includes kettle chips in a variety of distinctive and innovative flavors – examples include Dark Russets, Smokin' Sweet Crab, Smokin' Sweet BBQ and Jalapeno, as well as kettle chips made from sweet potatoes. The company's portfolio also includes

Boulder Canyon kettle chips – in addition to flavors such as Hickory BBQ and Malt Vinegar & Sea Salt, there is also a variety containing 60% less sodium.

In the Australian market, Snack Brands Australia supplies Kettle Chip crisps, which are unrelated to the Kettle brand. This range includes slow-cooked crisps in flavors such as Sea Salt, Chilli, Honey Soy Chicken and Thai Chilli & Wild Lime, as well as Kettle Chunky crisps – these are extra thick and available in flavors such as Himalayan Pink Salt, Flamed Steak and Roasted Tomato & Herbs. •

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Heating in Potato Storage Facilities

The quality of the potato and its storage life is directly impacted by the loss of moisture, decay and physiological breakdown. These deteriorations are directly related to storage temperature, relative humidity, air circulation and gas composition.

by Tudor Vintiloiu

In an attempt to attain the desired storage condition in an enclosure, many systems have been developed over the years depending on the geographic location, volume produced, consumer demand and the marketing strategies. Potatoes, being a living organism, require an effective management for storage. According to the Canadian Horticultural Council, temperature is the single most important factor in the keeping quality of stored potatoes. For most varieties, temperatures below 3.0°C and

above 15.0°C cause dramatic increases in respiration and are not recommended. With certain varieties, such as Shepody, holding temperatures as low as 2.0°C can be tolerated and may be required to control sprouting. Temperature also has an important relationship with relative humidity (RH). Warm air holds more moisture than cold air. Thus, even small changes in temperature can cause dramatic changes in relative humidity. For the same reason water loss from the tubers is greater at higher temperatures.

The most important biochemical process affected by temperature is the accumulation of sugars, which influences the cooking and processing quality of potatoes. At temperatures below 7.2°C, reducing sugars accumulate leading to dark chips and French fries when the potatoes are processed. At temperatures below 3.0°C the accumulation of sugars is so great that flavor and boiling and baking quality are affected. Potatoes that have sweetened due to low temperatures can be reconditioned to some degree, depending on variety, by raising the storage temperature to 13.0 - 15.5°C for 4-6 weeks before shipping. Sometimes, it is not easy to foresee weather conditions, potato tuber condition (and quality), store particularities and other factors, which have an influence on the product safekeeping. Automatic systems can easily meet such challenge, maintaining any preset parameters of temperature, humidity, duration of ventilation, heating or cooling and any other.

“It is important to size heaters to the ventilation system so that the return air is warmed 0.5-1.0°C. Note that a heating system of this size will cost USD5-10/hr to operate, so they are not a cheap option, but well worth it when dealing with rot.”

Canadian Horticultural Council

AUTOMATED SYSTEMS

akYtec is a German company that specializes in manufacturing a wide range of devices in the field of industrial automation, having a diverse product portfolio that can easily automate climate control systems for potato storages.

Their proposed system can provide the following functions:

- Supervision of: indoor and outdoor air temperature and humidity, temperature in air distribution ducts, and product temperature
- Control of fans and inlet and outlet air dampers
- Control of air conditioning
- Heating control
- Alarm.

"The SPK207 control panel serves as the main system unit. The panel displays set point values and current values of the system parameters.

Manipulating with touch screen, the operator can switch operation modes, supervise system parameters and get information about both the status of individual units and the system status in general," the company explains.

"Due to the input modules, the signals from temperature and humidity transmitters are amplified, filtered and converted into digital form. Robust RTD temperature transmitters with different probe lengths can be used for measuring product temperature and our DTS125L – for outdoor temperature. The PKG100-CO₂ carbon dioxide transmitter can be used to provide an optimal CO₂ concentration in the room. The quantity of modules depends on the storehouse capacity and on the quantity of the involved transmitters. The larger is the storehouse, the more modules are required," the company adds.

On the basis of information received from the transmitters, the system switches operation modes. There can be several operation modes available in the system: recirculation, airing, cooling, air humidifying or drying, heating and ventilation. Each mode is represented on the control panel screen in the form of a signal lamp or in a text form.

"We have developed sensors that create the perfect storage conditions for every potato store manager. Our automation systems provide the right balance between ventilation, heating and cooling."

Mooij Agro

akYtec's experts reveal that the position of inlet and outlet dampers in the main air channel and EC fans frequency in the air-ventilation chamber are controlled in accordance with PID mode of control, which implements the user program, depending on the temperature in the air channel. This temperature can be measured with our PVT100 humidity and temperature transmitters. The damper actuators and the EC fans are controlled by analog output modules. If there are not enough outputs of these two modules, additional output modules can be involved in the system to control other equipment.

"The most efficient practice is to install the input modules directly in the storeroom, the output module – in the air-ventilation chamber beside the power and actuated equipment, and the control panel – at the entrance to the storehouse. Often, there are two storehouses raised beside each other. In this case, it is better to organize a separate control room for both

control panels. For this purpose, it is recommended to use RS485 interface and twisted pair cables as connection lines," the company points out.

Mooij Agro is another leading company, which has the expertise to help managers store potatoes under optimum conditions, with maximum efficiency, anywhere in the world.

"We have developed sensors that create the perfect storage conditions for every potato store manager. Our automation systems provide the right balance between ventilation, heating and cooling. This is done on the basis of temperature, relative humidity and negative pressure in your store," the company says.

BULK STORAGE

Bulk storage is the most efficient and widely used method of storing potatoes for the processing industry. This is because bulk storage is perfectly suited for homogeneous, long-term storage of large lots. "Mooij Agro can help





you create the perfect climate for bulk stores, to prevent weight loss and pressure spots. We not only provide measuring and control equipment, but also the right fans, air inlets and air distribution systems. Depending on the climate and harvesting conditions, we also supply cooling, heating and humidification systems," the company describes.

STORAGE IN BOXES

Storage in boxes is ideal for seed and table potatoes. This allows store managers to easily grade and deliver a small quantity. The company's experts say they can

provide insight on the correct ventilation system for storing potatoes in boxes, noting that it is important that all the potatoes get the same amount of air, including the potatoes in the core of the box.

STORAGE IN BAGS

In some countries, potatoes are bagged directly in the field. These bags are then taken to the store. An advantage of this system is that the bags are traceable and can be easily sold in portions. "Particular care must be taken to ensure the air is evenly distributed throughout the store and into the core of each bag. This results in a homogeneous

ambient temperature and optimum air humidity for your potatoes," the company says.

HEATING FOR SOFT ROT

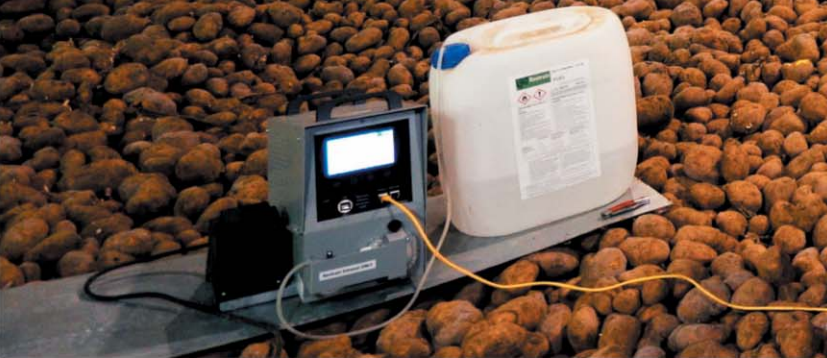
Over the past 10 years or so, many growers have begun using heaters to aid in drying. Although most modern, well-insulated potato storages don't require heat to keep the crop warm because the potatoes produce a significant amount of heat on their own, when dealing with rot, however, heaters above the pile will warm up the return air to the point that the control system must bring in extra fresh air to maintain the correct plenum temperature. "The extra fresh air will typically reduce the relative humidity (assuming the humidifier is off) by 3-4%, which can cut drying times in half. It is important to size heaters to the ventilation system so that the return air is warmed 0.5-1.0°C. Note that a heating system of this size will cost USD5-10/hr to operate, so they are not a cheap option, but well worth it when dealing with rot. Your ventilation supplier can help you select the appropriate heater or heaters," says the Canadian Horticultural Council. •

"The most efficient practice is to install the input modules directly in the storeroom, the output module – in the air-ventilation chamber beside the power and actuated equipment, and the control panel – at the entrance to the storehouse."

akYtec

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Restrain uses natural ethylene gas which keeps your potatoes dormant and prevents sprouting. Using ethylene gas means you won't leave any residue in your crop or storage facility, allowing you to deliver potatoes which can be used immediately for processing.



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Energy Efficiency Must Not Be Overlooked

Traditionally, banks of single speed fans have been used to circulate air through the pile of stored potatoes to remove field heat after harvest and to remove the products of respiration during the storage period. The highest ventilation rate is required at cool down thus the fan capacity is sized accordingly.

by Tudor Vintiloiu

Research by the University of Idaho suggests that a low constant airflow is more desirable than periods of high airflow followed by periods of no airflow.

VARIABLE SPEED DRIVE FANS

Variable speed drive (VSD) controllers on fans allow continuous air circulation at a lower rate during the holding periods, which saves a significant

amount of energy and reduces demand loads. A 1995 study in Maine estimated a 55-60% energy savings was possible with VSD fans. A more recent study (2003) in Idaho reported energy savings ranging from 33% for potatoes stored for 60 days, up to 45% energy savings for potatoes stored more than 125 days. The Idaho VSD study, quoted by the University of Wisconsin, reported 0.4% to 1.7% lower

shrinkage losses in a side-by-side comparison of storage facilities with constant speed fans and variable speed fans. "The percentage may seem small but on a 100,000 cwt storage facility the reduction in shrinkage would provide an additional USD2000-USD8000 in income," the researchers point out. No differences in potato quality were observed with the use of VSD controls in any of the studies.



SEALING AND INSULATION

Adrian Cunnington, head of storage research at **AHDB**, shared some insights for assessing and improving potato stores in a dedicated webinar.

"The loss of approval of CIPC will inevitably mandate change within the potato industry. For many it may mean using alternative sprout suppressants, such as mint oil, maleic hydrazide or ethylene. Others, particularly in the fresh sector, may choose to go chemical-free, moving to varieties with a longer dormancy period, or by storing at lower temperatures. For all, though, optimizing storage conditions and reducing operating costs are likely to be high priorities. Taking some simple steps to improve store efficiency may help to offset the potential increase in operating costs resulting from the use of more expensive sprout suppressants, or greater use of refrigeration."

According to the expert, the first step should be creating as well-sealed a store that is practically and financially feasible. No matter how well insulated a store is, insulation of the store is compromised if the structure is leaky – energy and sprout suppressant is escaping, adding cost to the business. Similarly, intake and exhaust louvres should close fully, with no daylight visible from inside. Replace any perished or missing rubber strips on the edge of the blades or doors to ensure a tight seal when closed.

Some areas of air leakage are not always immediately obvious to the naked eye. However, an energy efficiency assessment with a thermal imaging camera or a building pressure test may highlight otherwise unseen issues. Cracks or gaps in the structure can be identified as hotspots on a thermal image and should then be filled.

Once the store is well-sealed, the next step is to insulate. While sealing prevents air moving directly between the store and the external environment, insulation is important to prevent heat transfer through the fabric of the store.

"Skimping on store maintenance is the ultimate false economy. There are many tasks that are best done by professionals: checking sensors for accuracy, making sure louvres open and close freely, cleaning fan blades as needed, checking refrigerant levels, [...] all lead to higher costs."

Ray Andrews, managing director, Crop Systems Ltd.

Stores with existing insulation can be upgraded, as insulation can degrade over time through absorption of moisture.

Furthermore, damaged insulation will not function as intended and should be replaced; adding new insulation on top of old can also be beneficial.

It could also be a solution for store operators who have previously used CIPC and are concerned about future crops being contaminated by residue left in the surface layer of the building fabric. After cleaning, adding a layer of spray foam may help 'lock in' residual CIPC.

Effective and efficient airflow is also a key factor in achieving this in a potato store. If it is optimized, it should be possible in a well-sealed and well-insulated store to achieve a homogeneous climate, with similar conditions throughout.

STORE MAINTENANCE

Store maintenance is best performed when the store is empty, because any occurring

problems can be solved in time for the start of the new season. When maintenance is postponed, problems can build up and costs can escalate.

"The refrigeration system with the refrigerant and coolant (and sensors, oil compressor, cleaning air coolers/condenser) should be maintained based on a scheme meeting local regulations. And also the cleaning of air ducts and slatted floor should be performed, to insure a free air flow, so that unnecessary pressure isn't put on the ventilation system," says Jan van Maldegem, product manager, Tolsma.

"Skimping on store maintenance is the ultimate false economy. There are many tasks that are best done by professionals: checking sensors for accuracy, making sure louvres open and close freely and actually work, cleaning fan blades as needed, checking refrigerant levels, dirty coils, leaks and poor performance all lead to higher costs," adds Ray Andrews, managing director, Crop Systems Ltd.





ENERGY USE VARIABILITY

Potato Council's Project R401 – 'Reducing the cost of GB potato storage' (September 2007 - September 2010), which monitored the energy consumption of 32 potato stores over two seasons, concluded that the variation in the amount of energy used for potato storage by different stores is large. The likely contributing factors to variations in store energy use are:

- Store management and control.
- Air leakage – through doors, louvres, holes, etc.
- Refrigeration system efficiency.
- Insulation – type and quantity.
- Air movement efficiency.
- Temperature uniformity within store.
- The use of Humidification and Adiabatic cooling.

NEED TO REDUCE CARBON

Reducing energy use for storage is obviously important – not only for minimization of costs, but also for environmental reasons. Energy use leads to the production of greenhouse gases and global warming, so its overuse is not desirable. Carbon footprinting of

the storage process has become more common, but this is only realistic when proper evaluation of energy use is undertaken. With a 35 % difference between the smallest and largest published carbon footprint (32.68 kg/ton to 49.83 kg/ton) for storage, there is clearly some need to establish why there is a difference. It may be a realistic reflection of the true difference between store performance. However, it also is more likely to be as a result of variations in the way the carbon footprint has been calculated.

CONCLUSIONS

Carrying out any improvements, be it sealing gaps, adding insulation or installing sensors, requires time for labor and capital investment. Each store is different, and it can be difficult to predict what the financial saving and payback will be. But there will be one and, as the agriculture industry transitions to being carbon neutral, reduced energy consumption through better efficiency will be key: good for both the environment and a business' finances. •

“The cleaning of air ducts and slatted floor should be performed, to insure a free air flow, so that unnecessary pressure isn't put on the ventilation system.”

Jan van Maldegem, product manager, Tolsma

12 STEPS TO ENERGY-EFFICIENT POTATO STORAGE

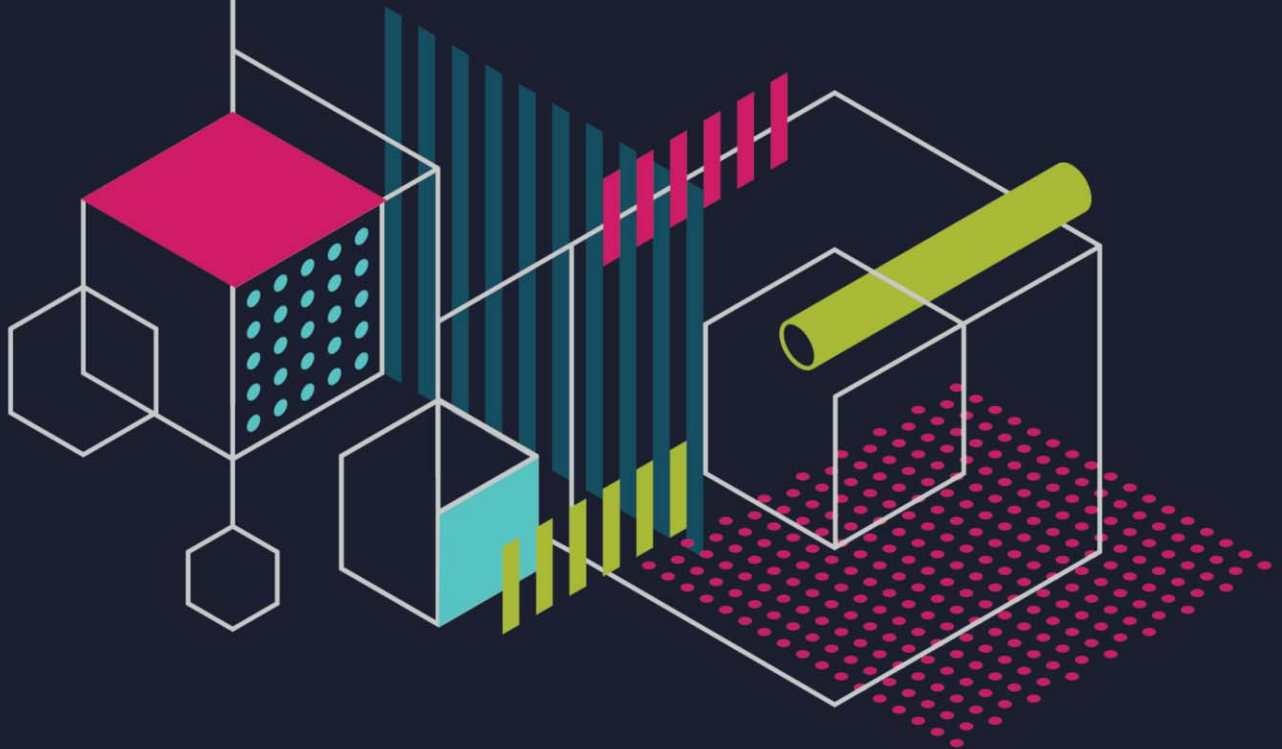
1. Use meters or sub-meters on individual stores or pieces of equipment to monitor energy use and highlight possible management changes
2. Ensure controls work correctly and consider ways to use cheap-rate electricity
3. Consider variable-frequency drives – these can be used on fans, condensers or compressors to improve energy efficiency – take care to avoid any effect on quality by reducing airflow too much
4. Calibrate temperature probes annually and verify with hand-held thermometer. Ensure correct location
5. Insulation – check for gaps or damage and ensure insulation thickness is adequate (80-100mm foam or boarding)
6. Fans and ducts – ensure inlet/outlet ducting allows for most efficient fan operation. Consider more aerodynamic fans
7. Doors, louvres and joints – seal gaps to reduce air leakage and use brush seals, rubber flaps, spray foam or silicon sealant where appropriate
8. Lighting – consider new energy-efficient technology when replacing lighting – for example, gas discharge tubes
9. Consider replacing old motors on graders or conveyors with more energy-efficient models
10. Get an energy audit – an independent check to highlight areas for energy saving – for example, Potato Council/FEC store check
11. Layout – ensure boxes allow uniform airflow
12. Hygiene – keep fans, ducts and coils clear of debris to allow good airflow.

Source: UK Potato Council

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2021 FEATURE PLANNING

1 JANUARY/FEBRUARY

Ad closing 25.01/Publishing 08.02

Processes

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

Expert View

Sharp Innovation in Potato Cutting
Smart Packaging and End-of-line Solutions

Spotlight

Seasoning, Flavoring and Additive Treatment

Markets

Western Europe

Products

Flakes, Pellets and Mashed Potatoes

Storage Special

Store Preparation and Hygiene
Storage Disease Control

Trade shows: Potato Expo/Jan 6-7, Fruit Logistica/Feb 3-5

2 MARCH/APRIL

Ad closing 22.02/Publishing 08.03

Processes

Drying and Dehydrating
Sorting, Blanching
Process Monitoring

Expert View

Optical Sorting - Ensuring a reliable and flexible production flow
Drying - Innovation in Belt and Drum Dryers
Blanching and its influence on crispiness, color and firmness

Spotlight

Process Monitoring - Digital Programming & Industry 4.0

Markets

Eastern Europe

Products

French Fries in Retail and Foodservice

Ingredients

Batters, Coatings

Storage Special

Ventilation, Drying

Trade shows: ProFoodTech/April 13-15, ALAP Congress/Mar 16-19, Foodex UK/Apr 12-14

3 MAY/JUNE

Ad closing 21.05/Publishing 04.06

Processes

Frying
Coating
Cooling and Freezing

Expert View

Innovative Frying Equipment for chips and French fries
PEF Applications in the Industry
Cooling, Refrigerating and Freezing

Spotlight

The Latest Reports on Acrylamide

Markets

South America

Products

Chips and Potato-based Snacks

Ingredients

Frying Oils

Storage Special

Humidity and Condensation Control
Cooling and Freezing

Trade shows: WPC & Europatat/May 31-June 3

4 JULY/AUGUST

Ad closing 19.07/Publishing 02.08

POTATO EUROPE SPECIAL - Road Map and Event Agenda 

Processes

Conveying Systems and Belts
Forming and Extrusion

Expert View

Innovation in Cutting Equipment
Conveyors and the transfer of potato products and snacks

Spotlight

Weather and Its Effects on Potato Crops

Markets

North America

Products

Batch Fried Chips

Ingredients

Salt Reduction

Storage Special

Heating in Storage Facilities
Storage Energy Efficiency

Trade shows: Potato Europe/1-2 September, Potato Association of America Annual Meeting/Jul 22-26, PMA Foodservice Conference and Expo/July 23-24

5 SEPTEMBER/OCTOBER

Ad closing 24.09/Publishing 08.10

INTERPOM SPECIAL - Road Map and Event Agenda 

Processes

Forming and Pasteurizing
Oil Filtration Systems & De-fattening

Expert View

Frying Innovation for French Fries
Conveying Systems & Inspection Tables

Spotlight

Cleaning and Sanitation Updates
Food Safety Regulations

Markets

Australasia

Products

Extruded, Pasteurized and Formed Potato-based Snacks

Ingredients

Flavors and Seasonings for Chips and Fries

Storage Special

Diseases and Defects
Sprout Suppressants in Storage

Trade shows: Interpom/Nov 28-30, PB Potato/Nov 24-25, Process Expo/October 12-15

6 NOVEMBER/DECEMBER

Ad closing 29.11/Publishing 13.12

FRUIT LOGISTICA SPECIAL - Road Map and Event Agenda 

Processes

Energy and Water Saving
Turnkey Projects

Expert View

Complete Lines for Processing
Advantages of Pulse Electric Field Technology in Potato Processing

Spotlight

Saving Water, Energy, Oil during Potato Processing

Markets

Global Market Predictions for 2022

Products

Global Market Predictions for 2022

Markets

Processed Potatoes Global Market Trends 2020

Storage Special

Storage Monitoring & Quality Assurance
Cold Storage Updates

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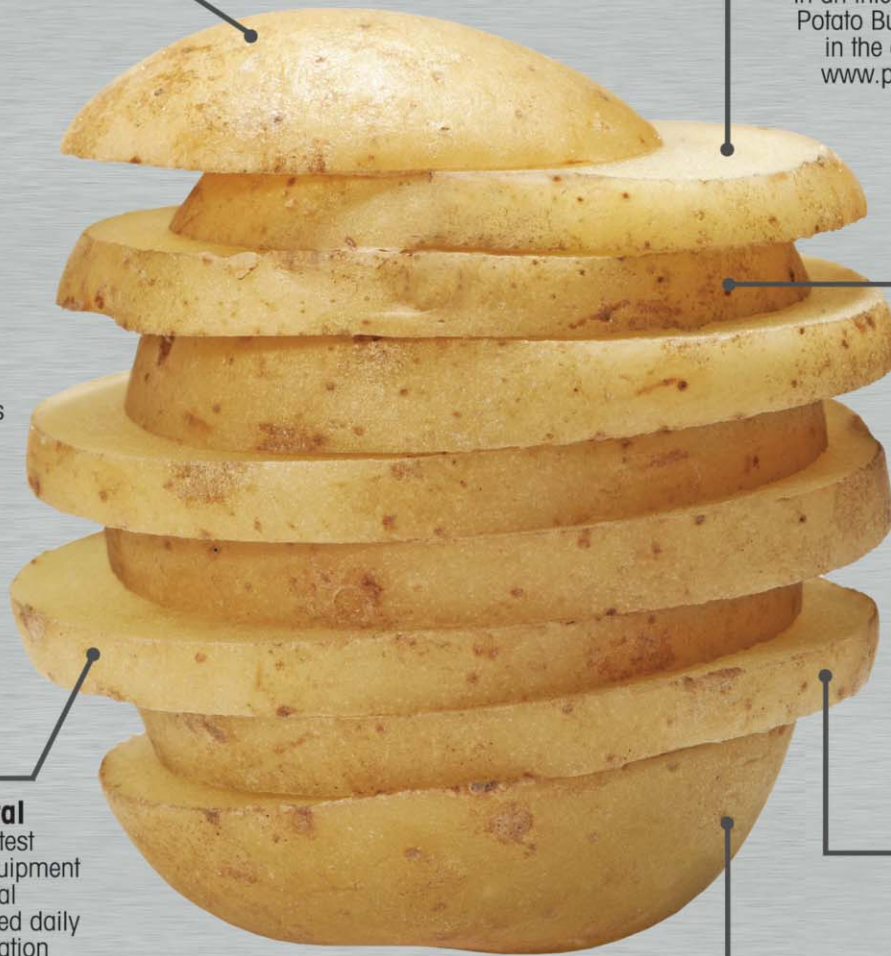
POTATO PROCESSING INTERNATIONAL

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.



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SPECIAL PROJECTS

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



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