

May/June 2020  
Vol.28 No.1

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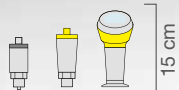


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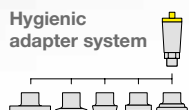
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# Extra funding and flights to help food exporters



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**T**he COVID-19 crisis is placing immense pressure on Australian food exporters; now extra government funding and a freight flight initiative have been established to help those hit hard by the crisis.

## Medical supplies for lobsters

On 1 April 2020, the government launched a new \$110 million flight program to help fresh food exporters deliver their produce into key overseas markets, with return flights bringing back vital medical supplies, medicines and equipment. The government has appointed former Toll Holdings managing director and former Linfox chief executive Michael Byrne to oversee the program.

Byrne will work with Austrade to help establish arrangements with exporters, airlines, freight forwarders and industry bodies plus oversee the mechanism's operations including advising the government of destinations, freight selection and prioritisation.

In addition, around \$10 million in Australian Fisheries Management Authority (AFMA) levies will also be waived for all Commonwealth fishers, ensuring they do not have to pay Commonwealth levies for the remainder of 2020.

Federal Trade Minister Simon Birmingham said the COVID-19 pandemic had led to major air freight shortages and had disrupted supply chains around the world.

"This temporary action will help Australian producers to protect the jobs of those who rely upon Australia's export of safe, quality food into the world," Minister Birmingham said.

"Getting our export sector back on its feet is crucial to reduce job losses through the crisis and a critical part of the ultimate economic recovery."

The initiative is part of the government's \$1 billion Relief and Recovery Fund to support regions, communities and industry sectors that have been disproportionately affected by COVID-19.

The initiative follows news from Western Australia where four lobster processing companies, led by the Geraldton Fishermen's Co-operative (GFC), have negotiated a similar deal with airlines to export a weekly shipment of 30 tonnes of live lobster and bring back medical supplies for the WA Government.

## Export cost reimbursement

In another initiative announced on 1 April 2020, the Morrison government will inject an extra \$49.8 million into the Export Market Development Grants (EMDG) program in the 2019–20

financial year, allowing exporters and tourism businesses to get additional reimbursements for costs incurred in marketing their products and services around the world.

Minister Birmingham said the funding boost would provide much needed relief and a timely cash flow injection for exporters and tourism businesses within the scheme who were doing it tough.

"We recognise the current COVID-19 crisis is placing immense pressure on Australian exporters and tourism businesses, many of whom felt the earliest and deepest aspects of the economic downturn," Minister Birmingham said.

The EMDG scheme is a key Australian Government financial assistance program for aspiring and current exporters. It has been a popular vehicle to support the costs associated in reaching new markets, and this additional funding will give Australian exporters and tourism businesses extra help in these tough times.

"It means businesses within the scheme who have spent their own money to market and grow Australian exports will receive more of that money back, up to 50% of their total eligible marketing expenses," Minister Birmingham said.

"This investment addresses the reality that businesses invested in good faith to lift Australia's exports, but are unlikely to see immediate return on those investments. These entrepreneurial and outward looking businesses will be crucial to our future economic recovery.

"This extra \$49.8 million to supplement the additional \$60 million already committed by the Morrison government will bring EMDG funding to its highest level in more than 20 years at \$207.7 million for the 2019–20 financial year.

"This support is in addition to other measures our government has announced to help small and medium businesses manage cash flow challenges and retain employees such as increasing the instant asset write-off, cash payments of up to \$100,000 and supporting apprentices."

Any business which has incurred eligible EMDG expenses for promotional activities in the 2019–20 financial year will be able to seek reimbursement for 50% of these expenses without the Export Performance Test applying, when they apply from 1 July.

Further information on the EMDG scheme and how to apply can be found at: [www.austrade.gov.au/Australian/Export/Export-Grants](http://www.austrade.gov.au/Australian/Export/Export-Grants).





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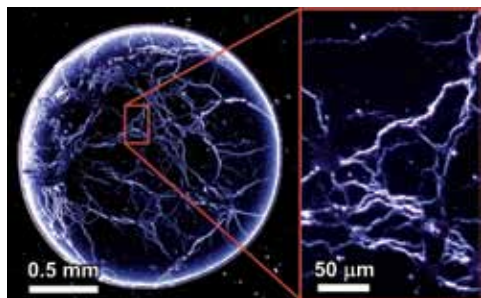
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## 'Whiskey webs' — a fingerprint for spirits



A drop of American whiskey evaporated to form a distinctive web-like pattern of solutes. Credit: Adapted from *ACS Nano* 2020, DOI: 10.1021/acsnano.9b08984

Known as the 'coffee ring effect', spilled coffee forms a ring as the liquid evaporates, depositing solids along the edge of the puddle — this has fascinated scientists for decades. Now a US-based team has uncovered the mechanism behind an even more striking, web-like pattern that forms when drops of American whiskey dry up. These distinctive 'whiskey webs' could someday be used to identify counterfeit spirits, according to the team's report in *ACS Nano*.

When a drop of liquid evaporates, solids are left behind in a pattern that depends on what the liquid is, what solids are in it and the environmental conditions. Stuart Williams and colleagues previously found that drops of diluted American whiskeys — but not their Scotch or Canadian counterparts — formed webbed patterns when dried on a glass surface, and there were hints that the pattern was distinctive for different brands of whiskey. In the current study, the researchers wanted to see how

the whiskey webs form in more detail, and whether they could serve as fingerprints of the spirits.

The team used time-lapse microscopy to examine droplets of diluted American whiskey as the liquid evaporated. Non-volatile organic compounds, such as phenols, aromatics and esters, clustered together and were driven to the surface of the droplet, where they formed monolayers. As the surface area of the droplet decreased, the monolayers collapsed, creating strands of the web. The researchers showed that different American whiskeys showed unique web patterns that could be correctly matched to unknown samples more than 90% of the time. The distinctive webs arise from the unique combination of solutes in each whiskey, the researchers said.



## Foodpro 2020 postponed to 2021

Due to the coronavirus outbreak, foodpro 2020 has been postponed. Originally scheduled to run from 5–8 July 2020, the event will now take place in 2021. The event was postponed following recent government advice on social distancing and travel restrictions. Foodpro prioritises the success and safety of its exhibitors and visitors, and is committed to supporting the food manufacturing and processing industry by offering the option to credit any deposits towards foodpro 2021.

For further information, please contact the team from Diversified Communications.

## How can manufacturers help with the COVID-19 response?

The Advanced Manufacturing Growth Centre (AMGC) has launched a portal for Australian manufacturing, component suppliers and skilled design, engineering and manufacturing experts to register their interest and core competencies in support of the national response to COVID-19. The COVID-19 Manufacturer Response Portal is currently live, with all contact treated in confidence.

Australian manufacturers across multiple disciplines have expressed a desire to support in any way possible to address the current COVID-19 threat. The portal has been designed to help those wishing to assist so that others can gain an understanding of the skills, supplies and capabilities that exist right now, and potentially connect with the right government department or manufacturer needed at this time.



Alongside the registration portal, AMGC has also increased its support of Australian manufacturers and will be boosting its online Manufacturing Academy learning portal to provide online webinars. The organisation will also be broadcasting current state and federal government tenders and expressions of interest via its website and social media platforms.





## Scientists develop a quick *Salmonella* detection method

The conventional scientific process for identifying bacteria's family — known as serotyping — can be time-consuming. For *Salmonella* it used to take three days, and in some cases more than 12 days, to assign a final classification for complex servovars.

Researchers have developed a method for completing whole-genome sequencing to determine *Salmonella* serotypes in two hours, and the whole identification process within eight hours. The study was conducted by researchers from Cornell University, the Mars Global Food Safety Centre in Beijing and the University of Georgia, with its findings published in *Food Microbiology*.

Determining *Salmonella* serotypes allows food safety professionals to find the source of bacterial contamination, which can occur in a range of foods such as fruits, vegetables, nuts, meat, cereal, infant formula and pet food.

“As the food supply chain becomes ever more global and interconnected, the opportunity for food to become contaminated with *Salmonella* increases. In the fast-moving world of food manufacturing, where rapid identification and response to *Salmonella* contamination incidents is critical, developing a more efficient pathogen identification method is essential,” said Silin Tang, lead author and senior research scientist in microbial risk management at the Mars Global Food Safety Centre.

Global food safety regulators, food authorities and public health agencies are opting to use whole-genome sequencing methods for pathogen subtyping rather than conventional serotyping to monitor *Salmonella* infections. Researchers have attributed this to the high turnaround times, costs and complex sample preparations associated with conventional serotyping.

The study assessed all 38 *Salmonella* strains — representing 34 serotypes — and accurately predicted the serotype level for all, using whole-genome sequencing. The findings present good news for the food industry, as very few laboratories can conduct classical serotyping. Whole-genome sequencing enables testing to be conducted in labs close to food processing plants, as the test uses simple equipment.

“In some countries, it can take up to two days to even get the suspected *Salmonella* to a certified lab,” said Martin Wiedmann, food safety professor and faculty fellow at the Cornell Institute for Food Systems.

## Foodmach joins the fight against COVID-19

Packaging automation manufacturer and integrator Foodmach has been recruited to build equipment that will enable an Australian manufacturer of surgical masks to increase production by 2500%.

The Department of Industry, Science and Technology requested that Med-Con, based near Shepparton, Victoria quickly increase production from 2 million to 50 million surgical masks a year. One of Med-Con's immediate concerns was that only



two of its three mask-making machines were operational. The machines were designed and built nearly 40 years ago, and no original drawings were available to reproduce them.

As part of this time-critical innovation challenge, Australian Defence Force (ADF) engineers disassembled and modelled the non-operational Med-Con machine. Several engineering firms were assessed for competency to reverse engineer and manufacture three new machines.

Foodmach has been appointed to engineer and build the machines due to the company's experience, capabilities and resources.

“Building packaging machinery requires strong expertise in mechanical engineering, electrical systems, pneumatics and motion control. Our pool of talent across all these fields and our one-stop-shop factory set-up means we can quickly build something new and complex like machines that produce surgical masks,” said Peter Marks, Director, Foodmach.

“We have 60 days from start to finish to find ways to build a machine that uses parts which have long been obsolete. Although 3D models have been provided by the ADF, these still need to be detailed on a part-by-part basis, materials identified and checks made that they'll assembly correctly. There will be knowledge gaps around material specifications and possibly tolerances which need to be resolved. The old design will also need to be updated to current safety, controls and interfacing standards.”

Foodmach's 6600 m<sup>2</sup> factory and machine shop space in Echuca, Victoria, will allow its 100-strong team of skilled staff to work around the clock — while maintaining enough distance from each other to manage COVID-19 risks.

Earle Roberts, CEO, Foodmach: “Keeping our workforce safe and productive in an epidemic that has the potential to threaten 40–70% of the Australian population is clearly a high priority for us. Staff will be working in shifts 24/7 during the next eight weeks to meet the deadline.

“The complexity of the Med-Con machines will provide us with an exciting challenge. We've obviously never built one before — but with all the necessary design, manufacture and assembly expertise under a single roof, we're well equipped for it.”

Foodmach is keeping a public log of project updates which can be found at <https://foodmach.com/project-med-con/>.





# Glug, glug, glug: what makes bottles empty faster?

**R**esearchers have zeroed in on the rhythmic sound bubble dynamics produce during bottle emptying to better understand the physics at play. The discovery from the researcher at the Indian Institute of Technology Roorkee may have a range of implications for many areas even beyond the beverage industry.

Bubbles have been studied extensively for centuries, including early efforts by Leonardo da Vinci who famously noted the sinusoidal rise of bubbles within a pool. The growth dynamics of bubbles at the mouth of a bottle depend on the thermophysical properties of the fluid, the bottle geometry and its angle of inclination. These inextricably intertwined parameters have made bottle-emptying dynamics the next frontier for bubble physicists.

Published in *Physics of Fluids*, from AIP Publishing, Lokesh Rohilla and Arup Kumar Das explore this bottle-emptying phenomenon from the perspective of bubble dynamics on a commercial bottle by using high-speed photography. Image analysis allowed them to conceptualise various parameters, such as liquid film thickness, bubble aspect ratio, rise velocity and bottle emptying modes.

“Bubble dynamics inside the bottle are too complex to study, so we divided the bubble interfacial growth into different stages to comprehend them,” Rohilla said.

It’s well known that a bottle’s emptying time is faster if you increase its angle of inclination. This increases what’s known as bubble pinch off frequency, and the relative increment depends on the thermophysical properties of the fluid.

“Our experiments suggest there is a critical angle of inclination, after which any further increase in the inclination of the bottle won’t lead to further reduction in the bottle emptying time,” Rohilla said. “This occurs due to the saturation of the voidage, space occupied by air within liquid surrounding, at the bottle’s mouth with the angle of inclination.”

Two distinct bottle-emptying modes were identified. In one mode, the discharge rate is increased due to a high frequency pinch off of air bubbles inside the bottle. In the other mode, it is caused by an increase in volume of the pinched-off bubble at a comparatively lower frequency.

“We’ve also observed an encapsulated bubble while discharging fluid in a vertically upended bottle,” Rohilla said.

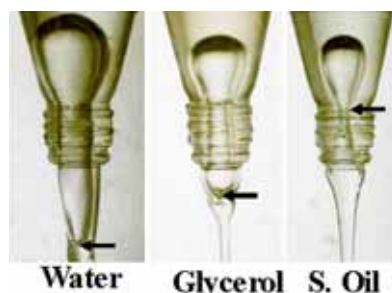
“Encapsulated bubbles have pinch off sites outside the bottle mouth, contrary to intuition. The presence of a violent ejector jet within inviscid fluids, in which liquid becomes thin due to almost no internal friction, and its complete absence within viscous fluids control the periodicity of the bubbles.”

This work proves that bottle geometry and thermophysical properties play a role in reducing the time it takes for a bottle to empty.

“We can manipulate the bottle discharge pattern by manipulating bottle geometry,” Das said. “An intuitive product-specific bottle design will enable better control of its discharge rate.”

The beverage industry and chemical plants are among the applications that will benefit from this better understanding of bottle geometry.

Credit: Lokesh Rohilla.



Formation of encapsulated bubbles.



Temporal evolution of the bubble within different fluids. Note the shape of the ejector jet after each bubble pinch off.

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# Cold-chain sticker

## indicates spoilt food



A warning sticker that indicates if cold-chain food products — such as fish, meat, and fruits and vegetables — are spoiled has been developed by the Korea Research Institute of Chemical Technology (KRICT), which is part of the National Research Council of Science & Technology.

The sticker is opaque when refrigerated due to nanofibre-induced light scattering, but becomes irreversibly transparent at room temperature through self-healing-induced interfibrillar fusion, which leads to the appearance of a previously hidden warning sign.

The cold-chain safety sticker is designed to help prevent the occurrence of food poisoning resulting from the malfunction of refrigerator or freezer trucks.

In general, when refrigerated or frozen foods are exposed to room temperature, bacteria begin to grow and reproduce. However, it is difficult to discern with the unaided eye if they have spoilt the food. This is because certain bacteria do not affect the taste and smell of foods where they live, and frozen foods have almost the same appearance even after a cycle of melting and refreezing.

The low-cost nanofibre sticker allows us to see with the naked eye if any cold-chain food products have been exposed to room temperature (10°C or higher). Room temperature exposure history and time throughout the cold chain delivery process are indicated but cannot be manually edited.

A research team from the Research Center for Bio-based Chemistry of the Korea Research Institute of Chemical Technology (KRICT, Dr Dongyeop Oh, Dr Sung Yeon Hwang, Dr Jeyoung Park, Dr Sejin Choi) developed this technology and published the relevant results in the journal *Advanced Materials online*, IF:25.809 under the title 'A Self-Healing Nanofiber-Based Self-Responsive Time-Temperature Indicator for Securing a Cold-Supply Chain'.

The core technology of the cold-chain safety sticker is its nanofibre film. At low temperatures, the film has a stable structure where thin threads intersect each other and thus appears opaque because the light is scattered. However, when exposed to room temperature for a certain period of time, the nanofibre structure collapses. More specifically, these thin threads start to melt and become entangled with each other. This allows light to transmit through the film, thereby making it appear transparent.

Based on this mechanism, when the film on the front surface of the sticker becomes transparent after being exposed to room temperature, the image produced on the typical film on the back becomes visible from the front. This change allows users to determine if their food products have spoiled.

Furthermore, the researchers found a way to control the time that is required for this nanofibre film to become transparent when exposed to room temperature. This was attempted based on the reasoning that the time needed before each food goes bad would vary.

Thus, each sticker was designed to become transparent after a minimum of 30 minutes and a maximum of 24 hours of exposure to room temperature. This works in the same way as a timer does. This technique was realised by controlling the composition and thickness of the used nanofibre.

Dr Dongyeop Oh from the KRICT said: "This sticker, once exposed to room temperature, cannot be restored to its original state even if one attempts to refrigerate or freeze it again. Also, room-temperature exposure time cannot be manually adjusted. This means that there is virtually no room for any manipulation."

Designed for food product applications, the sticker is thin and flexible and its manufacturing cost is low, so the technology is expected to have high potential for applications in the rapidly growing fresh food delivery market. It could also have applications for the cold-chain distribution of expensive medicine and medical supplies.



Dr Dongyeop Oh and Dr Sejin Choi from KRICT are holding sample groceries attached with stickers.



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## CASE STUDY

### Butchery improves supply chain using trackable pallet boxes



Based in the United Kingdom, Baird Foods is a pork butchery producing approximately 300–400 tonnes of boned pork a week. Its product is transported using the Dolav Ace plastic pallet boxes, which are re-usable, returnable and stackable. The company now sends all its pork product and by-product in Trackable Dolav boxes to customers in the UK and Europe.

With a unique identification number, each trackable pallet box is designed to automatically report its location back to the company once a day using technology from Sirius Asset Solutions.

“Sirius provided us with its immediately ready-to-use system for any Windows, desktop or laptop,” said Kevin Horner, General Manager of Baird Foods. “The system automatically locates every Trackable Dolav. User training took 15 minutes and there is no data entry and no maintenance because the Sirius system does everything. That is why we like it. It is fully automatic and tracks everything by itself. We don’t have to do anything.”

Baird Foods completed a one-off set-up task using a spreadsheet screen to enter the addresses of their customers’

sites and the area around them. The trackable Dolav pallet boxes are shown on the system as either ‘at a customer site’ or ‘not at a customer site’. The system also holds and displays the location history of every

box, for all boxes. Misplaced boxes can be easily located, as every trackable box has details printed on it to stop it going adrift.

“Now our Dolavs self-track and are returned. That cuts costs,” Horner said.

The trackable technology has reduced staff time and cost needed to recover stolen or lost boxes. It also prevents customers from keeping newer Dolavs and returning older, more worn pallet boxes. The Trackable Dolavs also identify routes experiencing box loss or damage, making administration easier. Each box is designed to ‘report in’ once a day with its location, and can do so for four years without requiring maintenance or recharging.

“The system is simplicity itself. We had our staff up and running on it in 15 minutes and immediately started to save money. We know where our Dolavs are, we can schedule them more efficiently and we can easily recover lost and stolen Dolavs. It’s win-win all around,” said Barry Baird, Director of Baird Foods.

*Dolav Australia*  
[www.dolav.com/en/](http://www.dolav.com/en/)

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## NEWS

### Reducing foodborne *Campylobacter* by 20% by 2025 in NZ

Deputy Director-General for New Zealand Food Safety Bryan Wilson has announced a goal to significantly reduce foodborne *Campylobacter* poisoning by 20% by 2025.

“*Campylobacter* is the most common cause of notifiable foodborne illness in New Zealand,” Wilson said.

“Working with the poultry industry, New Zealand Food Safety’s risk management strategy has achieved more than a 50% reduction in foodborne cases since 2006. This is a substantial reduction and one that we could not have achieved without partnership and support from industry. But, the rate of gastrointestinal illness caused by this bug remains high.”

The NZ government will continue to collaborate with industry to reduce *Campylobacter* rates with an updated strategy that includes enhanced consumer education, better hygiene through the poultry processing and food distribution chain, and improved measures at the poultry farm level.

New Zealand Food Safety has also commissioned a study to add a high level of scientific rigour to efforts to reduce foodborne illnesses, and the findings of the study ‘Source Assigned *Campylobacteriosis* in New Zealand’ have been released in March 2020.

The results from the study found more than 80% of human foodborne cases are likely due to the consumption of poultry meat.

“The intensive 12-month study included interviews with 666 individuals who’d been infected with the bug.

“As well as identifying the sources of *Campylobacter* illnesses in humans, the study identified several factors that may increase the likelihood of an individual contracting the disease.

“We’ll continue our work with industry to drive down the level of *Campylobacter* in poultry by understanding where the bacteria enter the food chain and where cross-contamination is likely happening,” Wilson said.



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# Keeping cool

## with meat marinade manufacturing

**R**eady Foods, a US manufacturer of soups and sauces, has cut the time it takes to chill one of its core products by a third, thanks to a turnkey cooling system from HRS Heat Exchangers. The solution, which is ideal for viscous materials, has enabled the company to significantly increase production of the meat marinade it supplies to a leading restaurant chain.

Based in Denver, Colorado, Ready Foods is a cook and chill company that manufactures soups and sauces for restaurants and the meat industry. After receiving a large order for one of its meat marinades, the company needed to increase capacity. The existing process of kettle cooking and steaming the marinade, then chilling it in 2.2 kg pouches in a water cooling system for three hours, wouldn't allow it to meet the customer's increased demand for 907 kg totes. So, Marco Antonio Abarca, President and Owner of Ready Foods, and Greg Hefter, Plant Engineer, set out to find an alternative solution that would enable them to decrease the length of time it took to cool the marinade from around 93 to 3°C and thereby increase production levels.

They soon discovered that finding the right cooling system was no easy task. "We are a medium-sized company but it became clear that most of the equipment suppliers were ac-

customed to dealing with much larger firms than ours; their proposals were totally unsuitable for our size of operation," Abarca admitted.

"Some recommended systems required a large footprint or a 20 ft [6 m] ceiling height; others could only supply one or two parts of the solution and expected us to source the rest and integrate it ourselves; while some showed us systems which were far too complex and sophisticated for our operatives to use," Hefter added. "We don't have the luxury of a team of engineers on call 24/7, so any system we chose had to be simple to operate and straightforward enough for our mechanics to take care of."

HRS Heat Exchangers was able to meet every one of Ready Foods' requirements, so they sent two versions of their marinade for testing. One was very thin while the other was a concentrated form of the product.

"At first, Ready Foods proposed cooling the thinner product using R-404 refrigerant," said Cameron Creech, HRS's US Sales & Engineering Manager. "As that's an aggressive cooling media, we considered a two-stage cooling system: the first phase would cool the product with chilled water, a much-less aggressive medium; the second stage would involve chilling with ammonia."





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“From a food safety point of view, the CIP system was crucial for Ready Foods.”

”

HRS's turnkey solution for Ready Foods comprises a transfer pump to move the product from the cook kettles into the balance tank; a balance tank to receive and mix both recycled and new incoming product; a BP-6 hydraulic pump to push product through the system; a pre-cooler, consisting of 10 AS Series triple-tubes as the pre-cooling exchanger, which cools the product using chilled water; the final cooler, comprising two Unicus scraped surface heat exchangers; and finally, a three-way valve, which sends product into the filler tank or back to the balance tank, depending on whether the temperature requirement is met or the filler tank is too full to receive product.

HRS also supplied auxiliary equipment, including a cleaning-in-place (CIP) system and a steam-powered hot water set to prevent freezing in the event of a production halt (also used to heat the solution during the automated CIP program).

From a food safety point of view, the CIP system was crucial for Ready Foods. “The product is very viscous so being able to clean the scraped surface heat exchanger was vital,” Creech said. “The CIP cabinet and system incorporate a centrifugal CIP pump installed alongside the BP-6 pump. This ensures the correct velocities are met, keeping the entire system clean and hygienic.”

The cooling system was commissioned in September 2018 and has been operating successfully ever since. The difference in the volume of product Ready Foods is now able to produce is considerable. “It used to take us three hours to chill the marinade, but we are now able to cool it in just one hour. We’ve been able to keep up with our client’s new, increased demand, even at peak times. On a five-day-a-week basis, we can hit 200,000 lbs [90,718 kg],” Abarca said.

From an operational standpoint, it’s proved itself to be an integrated system that is not too complex and boasts a small footprint.

“I’m surprised by how smoothly this project has gone,” Abarca enthused. “It normally takes a long time to integrate a system into a factory and that’s what I was expecting here, but that has not been the case. The cooling system has evened out the playing field by allowing a medium-sized company such as ourselves to compete with the larger firms. Not only that, but it’s the type of technology which suits a lot of applications. We are using it to make a meat marinade, but the reality is that we can do anything with it.”

HRS Heat Exchangers Australia New Zealand  
[www.hrs-heatexchangers.com/au/](http://www.hrs-heatexchangers.com/au/)



## Pork industry threat: African swine fever reaches PNG

Biosecurity Queensland has accelerated critical preparedness activities, after African swine fever was detected in the Southern Highlands Province of Papua New Guinea. The detection puts Queensland at the frontline of the disease, and heightens the risk to the state's pork industry.

"Biosecurity Queensland has been on the front foot in the fight against African swine fever and continues to work with the Australian Government and the pig industry to provide a united front against African swine fever. Australia is free from African swine fever and we want to keep it that way," said Mark Furner, Minister for Agricultural Industry Development and Fisheries.

"If African swine fever became established in Queensland it would be difficult to eradicate and could significantly impact pork availability, jobs and the economy. That is why African swine fever prevention and preparedness remains a priority for Queensland, and if it is detected here in Queensland we will respond."

There is currently no treatment or vaccine for African swine fever, and in its most severe form it can kill 100% of infected pigs.

"Given Papua New Guinea is one of our nearest neighbours, and the large feral pig population in Far North Queensland, people need to be aware of how they can help reduce the risk

of African swine fever. People illegally bringing pigs or pork products into Australia could introduce African swine fever, threatening our pork industry. While people can't be infected with African swine fever, it can easily be spread between pigs and can be spread on people's boots and clothing if not cleaned correctly."

Furner said extra vigilance was required in the fight against African swine fever due to the COVID-19 pandemic. It is advised that all pigs, domestic and feral, must not have access to meat or food contaminated by meat. Food scraps and waste should be disposed of in a secure bin, so pigs cannot access and eat it.

"If African swine fever enters Australia, COVID-19 restrictions would affect the way industry and government responds," Furner said.

Biosecurity Queensland has considered the current restrictions and is prepared and ready to respond working within the requirements.

"As COVID-19 is significantly impacting how we all go about our daily lives, the early detection and reporting of African swine fever is critical to stopping the spread of this disease," Furner said.

More information about African swine fever can be found at [qld.gov.au/AfricanSwineFever](http://qld.gov.au/AfricanSwineFever).



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# New technologies in salmon aquaculture

Increasing consumer demand for salmon has led the salmon aquaculture industry to adopt new technologies, many of which rely on compressed air.

**S**almon feeding has already been a pneumatic procedure for over 12 years, whereby the feed is directed from the feed silo into the salmon pens by a low-pressure air stream. This tried-and-tested technique is now leading to feed barges being designed with machine rooms beside the feed silos, in which the blowers can be housed to protect them from the outside elements.

Higher pressure compressed air applications are becoming more common in the aquaculture industry; operating in the seven bar range, compressors — either diesel or electric powered — are used to provide compressed air for tasks such as removing dead fish from the pens (morts removal) or to increase the level of oxygen in the sea pens (known as 'Sea Pen Aeration').

## Morts removal

Prior to this innovation, divers had to be dispatched to the pens to manually place the dead fish in baskets, which then had to be lifted out of the water by hand.

Now compressed air is used to remove dead fish from the sea pens; this is achieved by installing a cone connected to a tube into the deepest part of the pen. Compressed air is blown through the tube, forcing the dead fish up from the bottom of the pen, owing to the 'airlift pump' principle. The fish are then separated from the water so that the staff can assess the condition of the carcasses and conduct statistical analyses on them.

This is quicker than manually removing the carcasses, and also helps prevent the spread of disease. A further develop-

ment into the extraction of carcasses is to do the same with faecal matter; this method is being tested on closed pens on test farms, and could be used where both water quality and environmental impact are of key concern.

## Sea pen aeration

One of the most important uses for compressed air in aquaculture is sea pen aeration (SPA), a process whereby compressed air is blown into the pens through diffusers. As bubbles rise to the surface, a gas exchange takes place between the water and the gases in the bubbles, raising the oxygen levels in the water. It also results in artificial upwelling, forcing oxygen-rich, cold water from deeper down in the water column up into the pens. The oxygen levels are raised because colder, deep waters can hold more oxygen, mitigating the effects of environmental factors such as algal blooms, and temperature peaks, which can be dangerous to salmon. A further effect of the upwelling is that, thanks to the water at the upper levels flowing outwards, less of the oxygen-poor surface water enters the pens. Moreover, algae drifting in upper water layers are kept out of the sea pens by the outwards flow. This effect is most important during algal blooms and prevents the algae from reaching the salmon.

SPA is commonly used in Canada and Norway; other countries such as Chile or Scotland use bubble curtains to protect fish from swarms of jellyfish (Scotland) and algal blooms (Chile). In the past, jellyfish and algal blooms have wiped out entire fish stocks in some farms. As the compressor applications are new, many feed barges have nowhere to





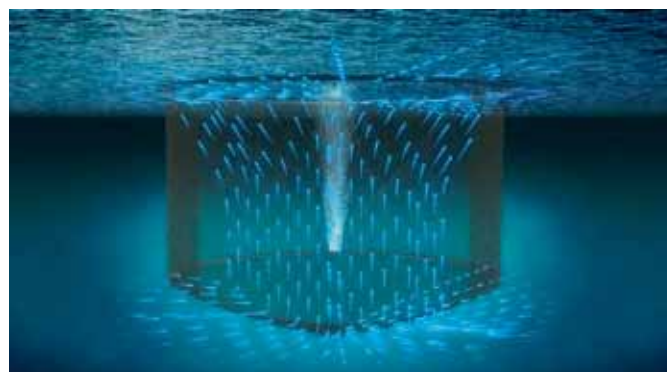
*A sea pen aeration system in full operation at a salmon farm site. Note: Four plumes of aeration inside each pen. [Source: Pentair Aquatic Eco-Systems]*

house the associated equipment; resultantly, compressors are either installed at the farms themselves, or on rafts built to accommodate them. Compressors with electric drive motors are housed within a container, whereas diesel-powered compressors are left exposed to the elements. Both compressors are designed for use on land; this has led to premature problems occurring with compressor operation, with the tough operating conditions associated with maritime use. However, compressors are needed to protect farms from jellyfish swarms, algal blooms and other potentially critical dangers.



*Left: Separation of carcasses and water in the mortis removal process.*

*Below: Operating principle of the SPA system [Source: Pentair Aquatic Eco-Systems]*



It was Thomas Kaeser himself, Chairman of the Board at Kaeser Compressors, who recognised the special needs of the aquaculture industry. The company commissioned an aquaculture specialist to examine the issues faced by compressors in a difficult operating environment, analysed key aquaculture markets and liaised with fish farmers and plant hire companies. The company then developed a prototype of a compressor that was designed for use in the aquaculture industry. The AquaSur 2018 was designed to withstand maritime environments and provide operational reliability. The prototype has since been refined, with Kaeser Compressors now offering a compressor configuration which delivers reliability under the harsh conditions of aquaculture applications. The increased service life make the compressors suitable for plant hire companies and fish farmers alike.

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## NEWS

## Talking turkey about reducing salt

A study published in *LWT-Food Science and Technology* has revealed that food scientists have produced a lower-salt processed turkey, which consumers preferred to a full-salt version in a blind sensory test.

"This isn't the Holy Grail, but it is one strategy that can help reduce salt content in processed foods," said Amanda Kinchla, senior author and extension associate professor of food science at the University of Massachusetts Amherst.

Processed foods are high in sodium because of the sodium diffusion that takes place inside the food during processing. Food product developers have discovered that they can manipulate the size of salt particles and use less if the salt hits the tongue first and lingers.

"That is amazing and clever, but it doesn't work with deli meat or foods with a lot of water. The salt will dissolve; you can't keep it on the surface," Kinchla said.

Using Kinchla's guidance, food scientists tested a method to reduce the excessive amount of sodium in processed turkey meat by using different sodium salt species. Using turkey breast meat as a protein model, scientists investigated whether limiting the sodium diffusion rates could reduce overall sodium while maintaining an acceptable quality of saltiness. To test this out, they incorporated sodium anionic salts, which held a larger structure or molecular weight than sodium chloride, or table salt.

"We processed a portion of turkey breast in traditional sodium chloride [table salt] and in these other salt species and measured a lot

of different things: the morphology, texture and the sodium diffusion rate in the meat with different variables, such as processing time, temperature and salt conditions," said Janam Pandya, lead researcher.

The scientists then recruited 46 people to participate in a sensory evaluation experiment of three different turkey samples: the control sample with full salt, and two with reduced sodium — one using disodium phosphate and the other a blend of sodium chloride and disodium phosphate. The participants primarily favoured the turkey processed with a 50–50 blend of sodium chloride and disodium phosphate, which had 20% less sodium than the full-salt control, compared to 41% less sodium in the disodium phosphate sample.

"Sensory results reported that the turkey prepared in a blend of two sodium salts was perceived to be as salty as the control while providing juiciness and texture scores that were preferred over the control," the study states.

The positive results from the study indicate that this is just one of the potentially successful strategies food scientists can pursue to make processed foods healthier.

"In our study, the use of sodium salts with a larger molecular structure, such as disodium phosphate, slowed down the overall sodium diffusion rate inside the turkey meat but left enough sodium on the surface of the meat for people to perceive enough saltiness. One approach is to find several small ways across the food supply to lower sodium without compromising the quality of the product," Kinchla said.

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# Processing





# Food manufacturers saving with solar

Food manufacturing is a power-hungry business and the rising cost of electricity is presenting challenges for the industry. In response, some manufacturers — both big and small — are choosing to switch to solar, resulting in significant energy savings along with reductions in carbon emissions.



**T**wo of Australia's leading smallgoods manufacturers — Tibaldi and D'Orsogna — have recently made the transition to solar with some of the largest roof-mounted systems in Australia.

Last year, Tibaldi installed a 1 MW roof-mounted solar system with 2962 panels. The system was cashflow positive from day one, provides more than \$330K in annual energy savings and cuts 1537 tons of emissions annually.

Tibaldi CEO Greg Ridder said they are always looking at innovation and sustainability of the business, so using the amazing amount of roof space on site for a large-scale solar system was an easy decision to make.

## Did you know?

### Making solar possible with government-enabled funding

Have you heard of Environmental Upgrade Finance? Also known as 'building upgrade finance', it is a government-enabled funding mechanism for upgrading existing building stock to be more environmentally friendly. Business owners can take out a long-term, fixed-rate loan for the total cost of the works, which is then repaid through their local council's rates system. Examples of projects that could qualify for this type of finance include solar installations, lighting, heating, ventilation and air-conditioning upgrades along with water and waste minimisation. To be eligible for the finance, building owners must pay council rates, ensure the planned works are improvements to non-residential buildings and deliver environmental benefits, such as energy, water and waste savings. The finance is currently available through councils in Victoria, New South Wales and South Australia.

Sustainable Australia Fund is a provider of Environmental Upgrade Finance. Originally established by the City of Melbourne in 2002, in 2019 the fund was recapitalised and scaled, through a partnership with Bank Australia, to drive environmental upgrades across Australia.

For more information, visit:

<http://sustainableaustraliafund.com.au/>

"This will help lower the cost of electricity, provide environmental benefits by reducing the reliance on the grid and also make Tibaldi more competitive."

Similarly, in 2019, D'Orsogna decided it made sense to utilise its vast roof space for the creation of its own energy supply while making a strong public commitment to sustainability.

Its 8500 square metres of rooftop solar powers a one-megawatt system that will be cashflow positive from year two, saves \$210,197 on electricity each year and cuts 1883 tons of emissions annually.

It's not just the larger manufacturers and food producers who are tapping into solar. Small to medium-sized businesses are also choosing to make the green switch — like Integrity Fruits in the Goulburn Valley, which installed a 100 kW solar system.

With tight profit margins and high labour costs in mind, Integrity Fruits Orchardist Peter Hall looked to gain efficiencies in other areas of the business.

"It all started when we started to requote our electricity contracts," Hall said.

"We're happy that it gives staff the sense that we are progressive; that they're working for a company that's innovative. It's good for people, for our region, for the environment and the world."

For businesses in the industry considering a move to solar, D'Orsogna Managing Director Greig Smith provides the following advice and insights:

- **When researching solar:** There are number of solar system providers in Australia. Go with those that have a proven track record and source and supply solar panels and inverters from leading manufacturers.
- **Installation:** The key is in choosing the correct solar system provider. Make a short list of the top two or three providers based on the quality of the equipment they supply, guarantees and their after sales service. Then negotiate the best price, guarantees and service package.
- **Post-installation:** In the price of the project, negotiate a service package to be included into the deal. To get the best performance out of your system it needs to be maintained and the solar panels need to be kept clean. This will ensure you get the best return and longevity out of your solar project.



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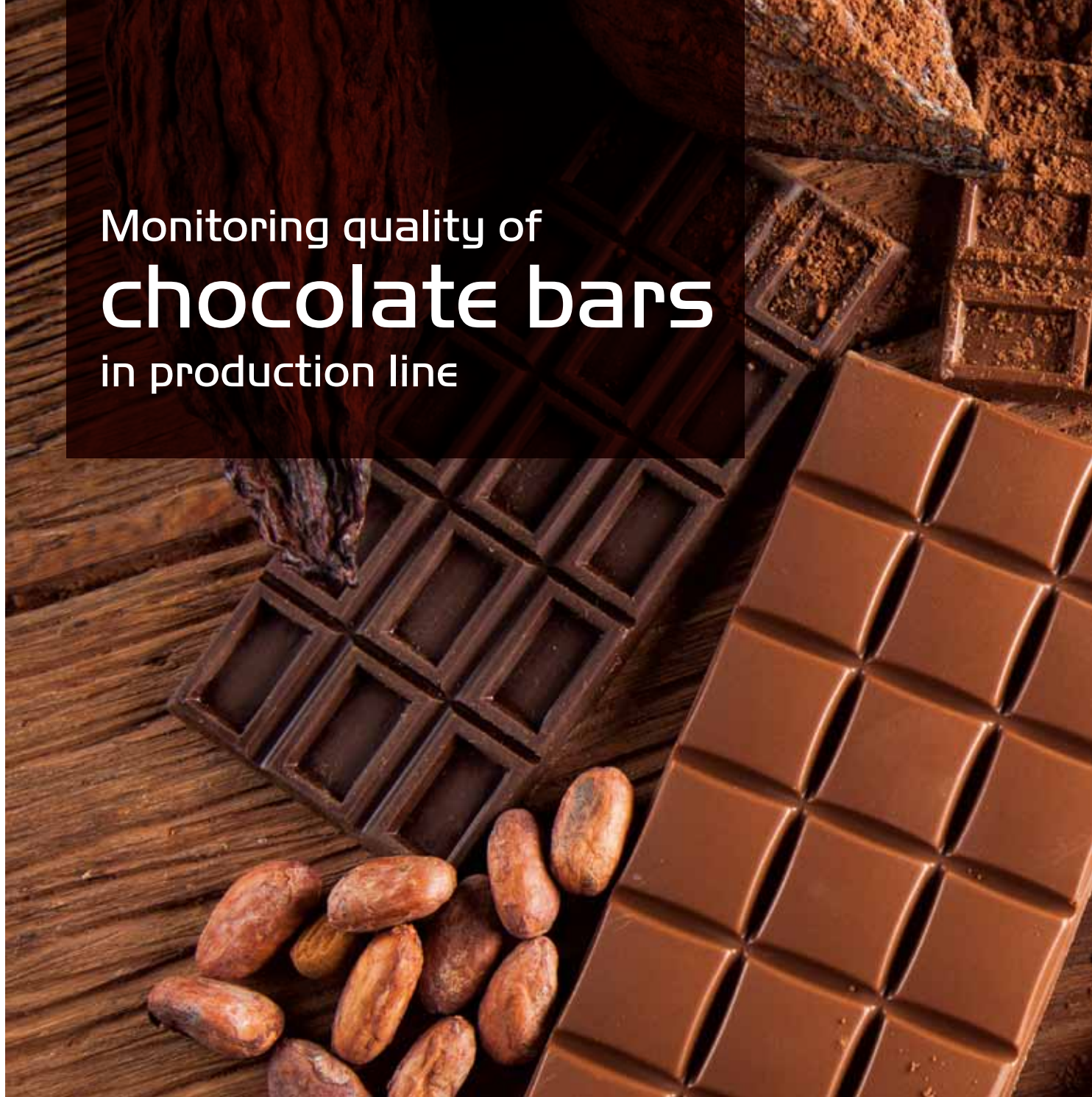
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# Monitoring quality of chocolate bars in production line



One of the most popular snacks in the world, chocolate, comes in a variety of sizes, shapes and flavours to choose from. It is generally available in various forms mixed with other types of snacks or in the form of solid chocolate bars. The taste and flavour of the solid chocolate bar highly depend on its dimension and shape. Moreover, deformed and ill-shaped bars also lead to a bad impression on the consumer by appearing unappealing to the eyes, which ultimately affects a company's branding and reputation in a negative way. For this reason, well-known brands always strive to consistently produce chocolate bars with identical dimensions since it acts as a trademark for their company.

As mentioned above, the exact dimension of the manufactured chocolate bar needs to be intact. It determines how quickly a chocolate bar would melt in the mouth, impacting the order and speed with which food molecules are released onto the tongue and indirectly influences the intensity of flavours in the chocolate. Therefore, a brand needs to keep

a check on the produced bars by applying quality control techniques in the production line, in order to maintain the high-quality taste and customer satisfaction.

Chocolate is now manufactured in a series of automated processes and the finished products are checked to ensure that they meet the standards. However, the quality control process is still not as advanced as the manufacturing process.

Traditional quality control methods were based on manual inspection of chocolate bars, which was very time-consuming and more prone to errors in judgment, or tactile measurements. The visual inspection method also







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does not produce consistent and reliable results as they largely depend on the mood and condition of the operators. Some manufacturers have also used laser point sensors, which turned out to be a rather slow process for this task. For faster and more efficient testing, manufacturers need to implement advanced sensor technology that is capable of providing high-speed scanning with accurate, reliable and precise results.

### Advanced laser scanning technology

Modern technology enables the use of non-contact sensors integrated in the processing line to monitor the contour and surface profile of the finished products. Using a laser profile scanner offers the possibility of significant time savings as compared with the traditional inspection process as well as high-precision quality checking in the production line. This measurement system can be employed

to the entire production range instead of relying on random checks to give real-time measurements.

Profile measurement using laser scanners is based on the triangulation principle. A laser diode projects visible light onto the surface, which is reflected from this point and then projected onto a CCD or CMOS detector. Special lenses are available for the purpose of enlarging the laser beam to create a static laser line instead of a point. This is considered a better technology as a more flexible field of view is achieved with the laser line technology.

Such an example is the scanControl 2960-100 laser profile scanner from Micro Epsilon. This sensor can be installed at some distance away from the objects which makes it suitable for measurement in most industrial applications. This sensor can reliably measure on objects with different surface properties such as light or dark chocolates. It also possesses a high throughput rate of 60 m/minute, it can accurately detect profiles of each chocolate bar and instantly transmit these data to the software. A software configuration tool enables easy set-up of predefined parameters and sensors.

The software enables the measured values to be calibrated to predefined parameters, consisting of the profile, width, height, depth, edge, groove, flatness and deformation. After all the parameters are scanned and processed, an “OK” or “NOK” signal is transmitted to the control system of the production line, so that any required modification can be applied immediately to the production process. Hence, this non-contact laser scanner makes it possible to prevent rejects and wastes by enabling intervention in an ongoing production process of finding a defect in the produced bars.

A blue laser scanner is also available which provides an accurate and reliable measurement on difficult surfaces such as organic materials. This blue-laser technology has some significant advantages over the red-diode based sensors as it doesn't penetrate the target. Therefore, it gives better results when used on a difficult surface and it doesn't get affected by emission of high-intensity light due to its shorter wavelength.

Bestech Australia supplies the high-quality sensors and instrumentations for measurement of physical parameters in Australia and New Zealand. With a team of factory-trained applications engineers and product specialists, we are more than capable to attend to any measurement difficulties in your industry.

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## On-machine seasoning system

Ensuring brand consistency is vital in snack food manufacturing. Consumers can tell when there's no salt on their chips or when seasoning is concentrated to just a few pieces. The FastBack Revolution Seasoning System is designed to help ensure a product looks and tastes the same each day, week and year of production.

The FastBack Revolution is an on-machine seasoning system that incorporates multiple innovations into a complete system approach to produce consistent seasoning coverage with little waste. It delivers good seasoning performance using a combination of the patented AccuFlavor Tumble Drum, the Modular Dust Collection System and the FastBack 260E-G3 Horizontal Motion Conveyor. This results in a compact, cost-efficient and standalone unit that is designed to overcome seasoning challenges at the weigher.

The seasoning system can be used for many applications, including potato chips, snack foods, crackers, tortilla chips, nuts and trail mix.

**Heat and Control Pty Ltd**  
[www.heatandcontrol.com](http://www.heatandcontrol.com)

## Smart dairy analyser

FOSS announces the MilkoScan FT3, a smart-enabled dairy analyser for instant multiparameter testing of a wide range of liquid and semisolid dairy products.

The device can test a broad range of samples, including chocolate milk, drinking yoghurt, whey protein concentrates (WPC) and more, for a variety of parameters such as fat, protein, total solids, freezing point and more. With its smart flow system, it can recognise and auto-adjust to each sample and delivers results within as little as 30 s depending on sample type. This should lead to immediate gains in production through the rapid availability of critical quality data for uninterrupted operations and rapid decision-making.

Comprehensive targeted and untargeted adulteration screening options are available and direct freezing point measurement of milk and cream is also provided.

The digital connectivity features built into the device help to keep all instruments measuring the same. For instance, it is simple to manage a population of instruments in a network set-up where a master instrument keeps the other networked instruments updated with new calibration models.

Using a patented form of instrument standardisation, the device automatically checks its performance every 2 h so that any signs of drift in results are spotted immediately. This avoids reference analysis checks required with earlier-generation instruments. It saves time, work and chemical reagents and helps to avoid worries about compliance with operating procedures.

With its built-in ID chips, the instrument monitors vital instrument components and a self-diagnostic system provides problem-solving hints that enable quick resolution. Online support for operators is available together with comprehensive digital and onsite service.

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## eBook: Measurement solutions for the food and beverage industry

Maintaining ideal conditions in food and beverage manufacturing processes, facilities and storage is complicated, if not impossible, without the proper tools. Vaisala has created an eBook called *Measurement solutions for the food and beverage industry*, which could help.

Some of the challenges the company recognised and has solutions for include: the optimal product moisture level is not taken into account so energy and money is wasted; unstable manufacturing process conditions decrease yields; end-products are too moist causing unwanted microbial growth; and lack of air quality decreases the comfort level and living conditions of plants, animals or humans.

**Vaisala Pty Ltd**

[www.vaisala.com/lifescience](http://www.vaisala.com/lifescience)

## Thermal imaging camera

Bestech Australia announces the release of the TIM40 small thermal imaging camera from Micro Epsilon.

Suitable for high-volume industrial applications such as in OEM, the camera has a compact and robust housing with IP67 protection. It has a measuring range from 20 to 900°C that caters for most temperature measurement requirements in industrial applications.

The unit comes with a motorised focus feature that allows the users to focus the camera on targets via remote control. This allows the unit to be integrated in an area where space is restricted.

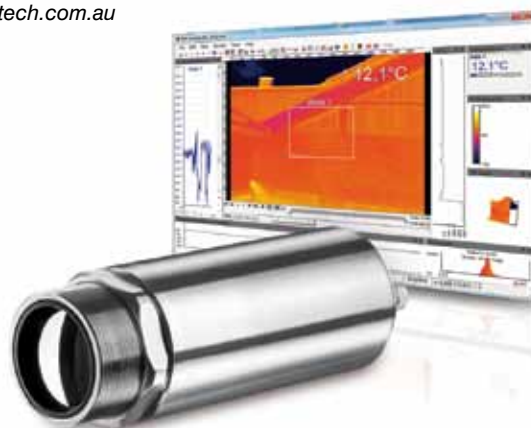
The TIM40 thermal imaging camera also has a good optical resolution with distance-to-spot-size ratio of 390:1, making it suitable for temperature measurement of small objects.

Featuring a fast frame rate of up to 80 frames/s for monitoring of fast thermal processes, the TIM40 can also be used for measurement of fast moving objects such as on conveyor belts or in research applications. The TIM40 can also be used as a fever monitoring tool in crowds to discreetly detect people with a high temperature. It can be integrated with an alarm system that alerts engineers and operators when the measured temperature rises above the defined threshold.

Integration of the camera into a user's existing system is easily done through a USB interface. The captured images are visualised in the software that is also easy to install and use.

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## Free online gas and liquid database

Bronkhorst High-Tech has expanded its database of gas and liquid properties from 1000 fluids to over 1800 fluids. This database, called FLUIDAT, is used for configuration and accurate calibration of its extensive portfolio of flow meters and controllers. The database can also be used for calculating pressure differences and valve seats. It is also available as a free, online calculation tool for Bronkhorst customers who want to determine conversion factors when they want to use their flow meter for a gas (or gas mixture) other than that for which the instrument is calibrated. The online calculation tool, Fluidat on the Net, is also suitable for physicists calculating fluid properties.

EL-FLOW Prestige, Bronkhorst's gas mass flow meters and controllers, are equipped with the data of 100 unique gases from the FLUIDAT database, offering the user flexibility in varying gas type with accuracy. With the embedded gas data, the EL-FLOW Prestige calculates in real time the gas conversion based on the actual gas properties. FlowTune enables the user to change the instrument's configuration via an RS232 computer port.

**AMS Instrumentation & Calibration Pty Ltd**

[www.ams-ic.com.au](http://www.ams-ic.com.au)

## Wall and ceiling hygienic cladding system

Based in Welshpool, WA, in Australia, SWP is the supplier of the CleanBoard PVC wall and ceiling panel system.

Suitable for use in hygienic areas, the panel system's features include: hygienic, washable (high-pressure hose), able to be disinfected, no rot or rust, no exposed screws/fasteners, resistant to chemical cleaning agents, suitable for wet rooms, easy to clean, high-quality and robust design, and compliant with food industry standards — (EU) No. 10/2011.

The product is made in Germany and manufactured from rigid PVC with a hard and shiny outer surface and either a foamed or hollow-section core. The panels are 200 mm wide, 9 mm thick and easy to install.

The CleanBoard system may be used for new or existing installations. For refurbishing existing installations, the panels may be screwed or glued directly over the existing walls. One of the panel systems (CB35) may also be used as a standalone separation wall; for example, in a bakery to separate the gluten-free area.

Applications include: bakeries, cheese factories, commercial kitchens, meat processing plants, patisseries and confectioneries, dairies, cold stores and fish/seafood processing plants.

**SWP Australia Pty Ltd**

[www.swpaustralia.com.au](http://www.swpaustralia.com.au)



## Hand sanitisers and disinfectants

Control Logic has sourced a range of Australian-made hand sanitisers and disinfectants that are claimed to provide up to 24 hours of continuous protection and kill 99.99% of germs and bacteria. Powered by Fresche Bioscience, Pure South Hand Sanitisers and Disinfectants are designed to provide a simple and effective way to stop contact-based infection. The range is alcohol-free and will not dry, crack or damage hands, to keep skin soft and healthy.

Traditional sanitisers kill bacteria by poison or high alcohol content; however, Pure South sanitiser is a food-safe, water-based surface sanitiser that is applied and allowed to dry. It utilises Quatlok technology to create an invisible microscopic layer of protection on the skin that lasts up to 24 hours. Washing hands and drying with a towel does not affect efficacy.

The range of commercial-grade surface spray and disinfectant is designed to protect surfaces up to 30 days untouched, reduce odour-causing bacteria and inhibit mould and mildew. The surface spray will destroy bacteria on the treated surface, and allowing the product to dry will coat the surface with a microscopic protective layer for continuous protection.

The commercial-grade range is suitable for any industrial or commercial environment.

**Control Logic Pty Ltd**

[www.controllogic.com.au](http://www.controllogic.com.au)



## CASE STUDY



### Holy guacamole, a viscous food pump

MasoSine Certa sinusoidal pumps from Watson-Marlow Fluid Technology Group (WMFTG) are enabling food producers to keep pace with the growing demand for pre-prepared guacamole.

Guacamole is both thick and contains solid pieces of avocado, neither of which is problematic for Certa sine pumps thanks to their effective yet gentle handling capabilities.

Unlike traditional pumps with rotors that cut through the fluid, Certa's sinusoidal rotor gently carries fluid through the pump to reduce shear. The fully CIP-capable pumps are designed to deliver high suction capability that can transfer foods with viscosities of up to 8 million cP, at flow rates up to 99,000 L/h.

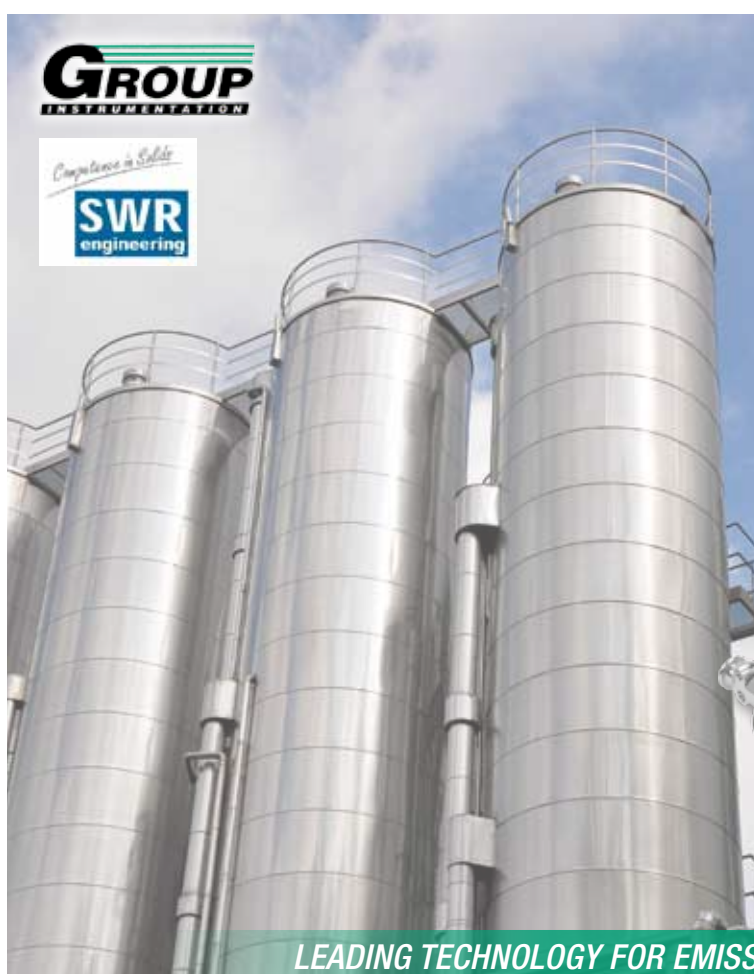
In addition, energy consumption can be reduced by up to 50% when handling high-viscosity foods such as guacamole.

The MasoSine Certa technology is used in two stages of guacamole production. Firstly, the pumps transfer avocado pulp to the mixers, before larger Certa models are deployed to transfer the product to the filling stations. At this stage, one of the benefits of MasoSine pumps is their ability to maintain the shape and integrity of the avocado chunks — and small pieces of tomato and onion — which are sometimes part of the mix.

The addition of these soft vegetable and fruit pieces would present a problem for most pump types; however, the low shear and gentle action of a MasoSine pump maintains the integrity of the avocado and additional ingredients. Crucially, the process doesn't affect the viscosity of the final product. The result is faster production speeds and, thanks to the inherently hygienic design of pumps, the process cleanliness is assured. According to the company, their customers have also reported reductions in maintenance requirements and downtime.

Having convinced several guacamole producers of the benefits available when using MasoSine Certa technology for transferring avocado pulp to the mixers and filling machines, the Watson-Marlow team is now talking to the same manufacturers about solutions for the next stage in the process — filling individual product portions.

Watson-Marlow Fluid Technology Group  
[www.wmftg.com.au](http://www.wmftg.com.au)



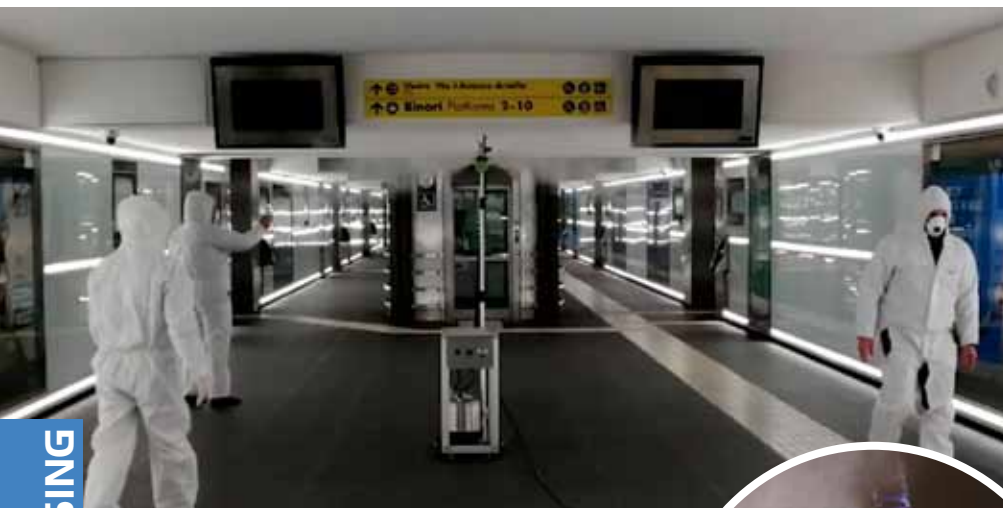
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## Dry fog disinfection system

Tecpro's AE-T portable pneumatic humidifier by AKIMist from Japan is designed to sanitise and disinfect enclosed areas up to 800 m<sup>3</sup> without causing excessive wetting of surfaces. The AE-T portable pneumatic humidifier uses 'dry fog' technology, producing uniform droplets measuring 7.5 microns. The droplets will not burst when they come into contact with surfaces such as walls, floors and ceilings, minimising risk of pooling, slipping or water damage. Dry fog is particularly suited to enclosed areas.

The AKIMist AE-T has a spray capacity of 2.4 to 9.6 L/h and comes with a telescopic pole, tank, gauge-mounted pressure regulators and a mobile mountain unit. The kit is also easy to assemble.

The portable pneumatic humidifier is suitable for sanitising shopping centres, train stations, airport terminals, sporting facilities and public toilets. In fact, any indoor areas where large numbers of people congregate, creating a high risk of spreading COVID-19. It can also be used in factories, warehouses and other large indoor spaces where cleaning and disinfecting is important all year round.

**Tecpro Australia**

[www.tecpro.com.au](http://www.tecpro.com.au)



## Modular pressure relief valve series

The SMC VP17 series of 3-port pressure relief valves allows for easy connection to filter regulator lubricator (FRL) units, where electrically operated valves are required. The modular valve series is suitable for pneumatic applications with air preparation equipment, where it's necessary to exhaust air to carry out maintenance. The valve series is efficient with only 0.35 W required to operate the DC type, and space savings can be achieved without the need for piping adaptors.



The IP65-rated enclosure is dust tight and water-jet proof to withstand a range of environments and applications. Due to its modular design, the series can be easily connected to an FRL unit and it is also possible to select a flow direction of left to right or right to left.

The VP17 series completes SMC's range of 3-port valves that can be connected to FRL units. Alongside the electronically operated valves, the range also includes manually operated valves (VHS), soft start-up function (AV) and safety standard compliant valves (VG/VP).

**SMC Australia | New Zealand**

[www.smcanz.com](http://www.smcanz.com)

## Functional ingredient

Phytolin is a dietary supplement as well as a flexible functional ingredient that can be incorporated into many food and beverage formulations derived from sugarcane extract. It contains natural antioxidants, minerals (potassium, calcium and magnesium), nutrients and essential amino acids.

The product's biological properties enable it to be used to formulate new products that can reduce glycaemic response (GR) or deliver a low GI, depending on the food or beverage matrix being considered.

Phytolin is a natural antioxidant that scavenges reactive oxygen and nitrogen species (ROS and RNS) that can build up in cells and organs. The antioxidants in the product have been designed to aid in addressing the damage caused by these free radicals.

The Product Makers food scientists have developed a wide range of applications for Phytolin for use in foods and beverages. The company can also work with other companies to jointly develop other functional products, while keeping within FSANZ guidelines.

**The Product Makers (AUST)**

[www.theproductmakers.com](http://www.theproductmakers.com)







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# The agile food producer

Being a food manufacturer comes with a number of challenges as companies try to meet the growing demands of customers and remain profitable in a largely low-margin industry. This is essentially true no matter where in the world you have production facilities.

Gone are the days when you could produce a small number of products on long-sustained production runs. Instead, you're producing more products in more varieties — for changing health, taste, image and cost preferences — in a greater range of packaging options. You're also fighting to balance the demands associated with branded products versus private label to maintain a foothold in existing markets, which are becoming increasingly segmented, while competing against global and local food manufacturers in emerging markets, such as China, India and Latin America.

Amid these competitive challenges, businesses also must contend with internal and external forces, such as limited capital funding, high commodity prices, legacy facilities and equipment, increasing regulations, and ageing workforces.

It's more important than ever to be prepared to do more with less. That means understanding the entire manufacturing spectrum and identifying areas where improved efficiencies can be realised. Food companies need to place greater emphasis on achieving operational improvements, increasing asset utilisation, maximising yield, increasing throughput and improving safety.

Proactively seeking improved efficiencies and then taking real action to achieve them will better position you in this highly dynamic, continually evolving industry to retain your hold in different markets and stay in the black.

More products—and more product varieties—are being made than ever before. According to the US Department of Agriculture (USDA) Economic Research Service, the number of new food and beverage products introduced in the United States alone grew from less than 10,000 in 1992 to more than 21,500 in 2010. Additionally, a 2012 KPMG survey said that new products and services would be the top focus for food manufacturers' capital spending for the following year.

Concurrently, long-time sought-after brands from the West have seen their dominance dwindle in emerging global markets, where regional products and private labels have increasingly won the favor of the growing middle classes.

This presents many challenges — increasing commodity prices, ageing equipment and infrastructure, more stringent yield expectations, higher shipping costs, global competition — for businesses that are largely unseen to customers, who merely want their preferred brands to be available, consistent in quality and at the price they're accustomed to. And with more food options available to them than ever — whether from local niche providers or big-box national retailers — these customers have more reasons to leave their brands for something new, better or cheaper.

## Summary

The food-production process too often takes place in a black hole, with a lot of unknowns on the plant floor — from the real value that assets provide to the 'how' and 'why' behind line failures.

Limited capital funding may mean the ideal '100% efficient' operation is unattainable. But working with automation- and safety-solutions providers can equip you with a better understanding of your production cycles and discover where efficiency improvements can be achieved that translate into real cost savings.

Rockwell Automation works closely with companies to deliver validation and value statements before investments are made, allowing you to see potential for improvement — improving yield by X percent, reducing maintenance time by Y percent, increasing line throughput by Z percent — and the estimated dollar value of those investments.

As the food market gets bigger and your operations get leaner, the key to success will be finding efficiencies that drive success across your entire production process.

Full Article URL: [https://literature.rockwellautomation.com/idc/groups/literature/documents/wp/food-wp005\\_en-e.pdf](https://literature.rockwellautomation.com/idc/groups/literature/documents/wp/food-wp005_en-e.pdf).

## Rockwell Automation

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## NEWS

### Processing vegetables with a belt cutting machine

German-based company Erhardt produces organic condiments such as ajvar, harissa and horseradish. The company uses a KRONEN GS 10-2 belt cutting machine for processing a range of vegetables used in the condiments.

At its facilities in Urloffen, Germany, the company cultivates many of its ingredients such as eggplants, peppers, horseradish and pepperoni. Other organic vegetables are purchased from regional providers and are processed at Erhardt's factory. The cultivation and processing of raw products, alongside the production of condiments, achieves high product quality through compliance to different standards and gentle processing of the ingredients. The company produces aromatic, hot and spicy pastes, dips and sauces, and is certified by Demeter and other inspection authorities.

The condiments produced by the company are made from recipes developed by owner Frank Erhardt, both as a spice base for further processing in large containers, and in small quantities for end consumers. Alongside ajvar and harissa, the product range includes mustard, pesto, dips and products based on horseradish.

The company opted for a KRONEN GS 10-2 belt cutting machine to increase production efficiency, as the machine can help to save time in the production process. The machine is equipped with a block knife for 12 mm cubes or a double strip cutting disc, which can be used to process pepperoni, eggplant and peppers. A few months after installing the GS 10-2, Erhardt was able to increase its processing capacity, without sacrificing the quality of processing.

The increase in the company's production capacity has led to growing exports of its products to Switzerland, France, Great Britain, Italy and Scandinavia.

Reactive Engineering Pty Ltd  
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### Compact glass filler for beer and CSDs

The Craftmate G is a glass bottle filler, from Krones' Modulfill series. It features a vent tube, and can be combined with up to two closers for crowns, screw-caps or aluminium roll-on closures. This enables brewers to handle not only beer, but CSDs as well. The complete system of filler and one or more closers is available in both directions of rotation, reducing the limits imposed on integration into existing lines.

The system's front table is self-draining; the roof construction of this table enables residual liquids to be purposefully drained into a channel system affixed to the low points of the tabletop. The filler also differs from other models in the Modulfill series, as the machine's guard is installed directly at the table. Moreover, the control cabinet, valve node and vacuum pump are grouped together in a single module, permanently attached to the machine.

Though necessary gush-type jetting systems are integrated, exterior cleaning of the machine is performed manually. Optional extras include a freestanding bottle shower and the modularised vacuum pump cooling system.

The compact system has two pitch circle diameters of 1440 and 1800 mm, enabling an output of up to 24,000 containers/h, making it suitable for small and mid-tier breweries.

Krones (Thailand) Co Ltd  
[www.krones.co.th](http://www.krones.co.th)



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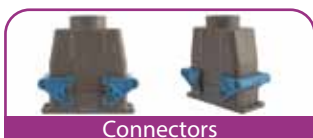
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## Stainless steel cabinet cooler systems

Exair's Dual 316 Stainless Steel Cabinet Cooler Systems with ETC (Electronic Temperature Control) keep electrical enclosures cool with  $-7^{\circ}\text{C}$  air while maintaining the NEMA 4X (IP66) rating of the enclosure and removing the heat that could adversely affect the internal components. The wear, corrosion and oxidation resistance of type 316 stainless steel provides long life and maintenance-free operation within food, medical, pharmaceutical, chemical and other harsh environments. Cooling capacities up to 5600 Btu/h are suitable for larger enclosures and heat loads.

The digital ETC is designed to provide precise temperature control for an electrical enclosure that is constantly being monitored by a quick-response thermocouple. It joins Exair's complete line of NEMA 12, 4 and 4X Cabinet Cooler systems which are available from 275 through 5600 Btu/h. They are available in aluminium, 303SS and 316SS materials. Exair offers Hazardous Location Cabinet Coolers with UL classified listing for enclosures within classified areas in need of cooling. The broad line also includes non-hazardous purge models, high-temperature models, continuous operation and thermostat-controlled models.

The systems are available with cooling capacities of 3400 up to 5600 Btu/h and all are UL listed and CE compliant.

Applications include cooling control panels used in food processing, as well as pharmaceutical, foundries, chemical processing and other corrosive locations.

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## CASE STUDY

# Wastewater solution for the meat processing industry



Managing the high loads of fats, oils and grease (FOG) and suspended solids (SS) typically found in the food processing industry can be challenging. The high FOG and SS loads in meat processing wastewater, in particular, can have detrimental effects on local municipal treatment plants and the connecting pipelines.

Aerofloat's patented dissolved air flotation (AeroDAF) technology has combined proven traditional dissolved air flotation principles with innovative design elements. The technology has been implemented successfully at many meat processing businesses around Australia, removing the high levels of FOG and SS in the processing effluent. Aerofloat is also able to offer solutions for food processing plants with wastewater high in chemical oxygen demand (COD) and biochemical oxygen demand (BOD).

### A compact solution

The AeroDAF provided a compact solution to Italia Smallgoods in Sydney.

Located in one of Sydney's more densely populated inner suburbs, Italia Smallgoods needed a wastewater treatment solution that would fit within the tight space available and ensure it met Sydney Water's strict regulations.

The company contracted Aerofloat to provide a wastewater treatment solution given the adaptability of its proprietary technology: one of the key features of Aerofloat's patented AeroDAF 100 unit is its compact nature.

Aerofloat completed the design for Italia Smallgood's wastewater treatment solution in-house at its Sydney factory. 3D models of the design gave Italia Smallgoods confidence that the system would fit the limited space, before installation commenced.

Sydney Water required Italia Smallgoods to treat its wastewater at the point source before discharging to sewer. As a producer

of fine Italian meat products, Italia Smallgood's wastewater was high in suspended solids (SS) and fats, oils and greases (FOG).

The compact AeroDAF 100 provided Italia Smallgoods with an effective solution that enabled it to meet Sydney Water's trade waste requirements, without taking up valuable space.

The AeroDAF's unique mechanics ensured Sydney Water's requirements were met.

"The wastewater treatment plant installed included an AeroDAF 100 as well as hydraulic balancing, pH correction, flow monitoring, a polymer make-up system, two pump stations and one waste tank. It fit all the criteria for treating Italia Smallgood's effluent and ensured that it met Sydney Water's strict requirements," said Michael Anderson, Operations Manager at Aerofloat.

The AeroDAF uses a unique tank with a 60-degrees conical bottom and conical top and a patented hydraulic float removal system to funnel waste float material from the top of the tank. The waste material is removed from the enclosed tank by using the hydraulics on the incoming feed stream. Unlike a traditional DAF wastewater treatment system, mechanical scrapers are not required, resulting in a compact, mechanically simple and affordable solution.

The management team at Italia Smallgoods was highly satisfied with the system.

"Aerofloat's AeroDAF fit our tight space and was installed on time and on budget," said the Manager of Italia Smallgoods.

The AeroDAF also offered a reduced odour solution to Italia Smallgoods, ensuring a healthier and pleasant working environment for its staff.

"Health and safety are also very important to our food preparation, so a system that contained odours whilst ensuring we met Sydney Water's strict wastewater requirements was an absolute win-win for us," said Italia Smallgoods.

Aerofloat is an Australian-owned, family-run business that designs, manufactures and installs wastewater treatment systems across Australia. While the AeroDAF system forms the cornerstone of the DAF product range, Aerofloat has several dissolved air flotation products and other non-proprietary solutions.

Having a dependable and adaptable wastewater treatment system has never been more critical as Australia deals with the COVID-19 crisis. Aerofloat remains operational during the crisis, supporting Australian businesses to meet consumer demand.



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## Scraped surface heat exchanger series

The HRS RMP Series of scraped surface heat exchangers is designed to improve the heat transfer of viscous materials and is available in single and multiple tube configurations. The R3 model contains three tubes, which provides a greater heat transfer area within the same footprint as a single unit. It also has the benefits of a single heat exchanger, such as a single set of connections to the product and services, and the reliability of a single drive assembly compared with multiple motors.

In its standard configuration, product passes from a single-entry point through the three tubes in parallel before exiting the exchanger from a single port. This reduces the overall velocity of the product as it passes through the heat exchanger and prevents operation in a pure counter-current flow.

However, the new multi-pass arrangement, known as the RMP, now links each of the three tubes in series: product enters through one tube, passes down the next and then moves back up the third. The use of longitudinal baffles in the outer shell achieves a true counter-current flow to improve heat exchange efficiency, while maintaining product velocity helps reduce pressure drop and increases product mixing. Crucially, the RMP maintains the overall large surface area of a standard R3 system within a compact unit — one of the system's key benefits.

As the new layout has a consistent cross-sectional area, the risk of dilution and blending from cleaning-in-place (CIP) operations is greatly reduced compared to other large surface area heat exchangers. Flushing is therefore more efficient, enabling greater recovery of high-value products without contamination or mixing, while the cleaning phase itself is also more effective due to the maintained velocity.

The RMP Series is suitable for a range of challenging viscous materials and is being deployed in a number of sectors, including viscous and starchy foods, such as thick sauces, pastes, creams and pet foods, for example.

**HRS Heat Exchangers Australia New Zealand**

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## Forming & Portioning machinery

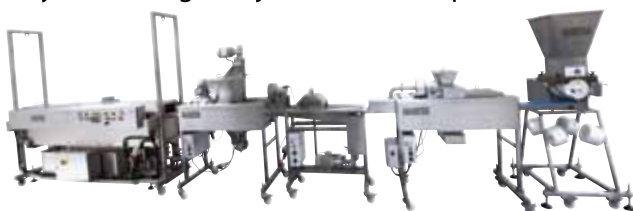
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Image credit: Aerofloat

## Aerofloat receives Consensus GreenTech Award for innovation

Aerofloat, an Australian company specialising in wastewater treatment solutions, has unveiled its website, months after the company received the Consensus GreenTech Award for its innovative design in wastewater treatment. The newly designed

website reflects the company's growth over the last decade and showcases Aerofloat's reach in the wastewater industry.

"Aerofloat has changed dramatically since we first launched the company in 2009. We wanted our new website to reflect the growth and extensive industry reach we now have," said Katie Moor, General Manager of Aerofloat.

Aerofloat received the Consensus GreenTech Award in December 2019 for its innovative design for treating and recycling process wastewater generated in the plastics recycling industry. Previous Consensus Award winners include Atlassian and WiseTech as well as Leaf Energy and AMPAN.

Aerofloat has previously received two federal government grants to commercialise its innovative designs and two growth grants to further develop its technology.

Its technology has also been implemented across business in the food and beverage industries throughout Australia.

The COVID-19 pandemic has placed significant pressure on many of Australia's food production and packaging businesses to produce beyond their normal range of production. Aerofloat has remained operational during the COVID-19 crisis, providing access to sustainable wastewater treatment solutions to meet consumer demand.

"Our engineers are proficient in sophisticated 3D modelling, so any proposed design is clearly presented and understood prior to project commencement. The design models are also invaluable for new building projects where evidence of a wastewater treatment plan is required to gain development approval," Moor said.

Prior to proposing a solution, Aerofloat's chemical engineers also conduct extensive jar testing of existing wastewater and review data trends to inform the best solution. Aerofloat's website and company video reflect the fresh approach the company has towards finding sustainable solutions for wastewater treatment across industries.

## Forming and Portioning with a difference

The Formatic range of machines will form and portion products including meats, chicken, fish, cheese and cookie dough's into a variety of shapes. If you are looking for a forming machine which is easy to operate and clean, involves minimal pressure and mixing of your product, and has low maintenance, then look no further -

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## CASE STUDY

### Cobots improve productivity on packaging line

Australia has some of the highest labour costs in the world, so naturally, optimising processes and using skilled labour where they are most valuable makes sense. While some are still of the opinion that automation is costing jobs, automation can result in creating new jobs and enhancing productivity.

Universal Robots (UR) recently helped global healthcare brand Sanofi to free up time where it was needed most, by providing seven UR10 collaborative robots (cobots) at Sanofi's Tours site in France. The integration into packaging lines was used to meet new productivity requirements that optimised the organisation and reduced load carrying and operator movements in palletising boxes with tablets and capsules. Thanks to the installation of the UR cobots, Sanofi has increased its production and improved health and safety related to the reduction of MSDs (musculoskeletal disorders) of its operators. The employees now have time to focus on higher value-added tasks.

"Sanofi wanted to reduce the load carried by the operators working on the line. While one cardboard box wasn't very

heavy, lifting a total of around 300 to 700 kg per person per day quickly added up!" said Darrell Adams, Head of Southeast Asia Oceania for Universal Robots.

Used for palletising, the seven UR10 cobots offer a payload of 10 kg and a reach of 1300 mm. According to Sanofi Tour's new works manager, Giles Marsal, these compact cobots are suitable for applications where an arm needs to be installed between two pallets.

"The team were pleased with the ease of programming and the cobots' flexibility, making it possible to add various sized grippers in just a few seconds. The cobots continue working hard, loading and unloading pallets at the end of the line with no strain at all. The application also offers the possibility to change pallets next to the palletising robot safely," Adams said.

Sanofi also noted that the integration of these cobots has brought ergonomic benefits in terms of load carrying and travel, and a notable reduction in the work time on the line for its operators.

The cobots have resulted in improved productivity and turned tasks from repetitive to rewarding for employees.

Adams concludes that just like Sanofi, manufacturers around Australia can also benefit from deploying cobots in a range of industry sectors.

Universal Robots  
[www.universal-robots.com](http://www.universal-robots.com)







## Motorless electric actuator series

SMC's LE Series motorless type electric actuators are suitable for applications with existing motor platforms that now require a customised solution. The motorless option is available for a range of electric actuators within the LE Series and is compatible with 16 motor manufacturers, including Rockwell, Mitsubishi and OMRON.

The LEFS Electric Actuator features a ball screw drive, with a 100, 200 or 400 W AC servo motor. Featuring various motor mount options and a compatible guide, the LEFS slider is suitable for constructing gantry-style systems and heavy offset loads. The LEFS slider comes in three body sizes (25, 32 and 40), with a maximum workload of 60 kg and a maximum speed of 1500 mm/s (H lead). It features a stroke range of 50 to 1000 mm in 50 mm increments, with a positioning repeatability of  $\pm 0.02$  mm.

The LEFB Electric Actuator features a belt drive, with a 100, 200 or 400 W AC Servo Motor. The LEFB slider also comes with a flexible motor mounting option, to allow for protruding loads. Being belt driven, the LEFB slider is suitable for long stroke applications for traversing lighter loads and high speeds. The LEFB slider comes in three body sizes (25, 32 and 40), with a maximum speed of 2000 mm/s, maximum stroke of 3000 mm and a positioning repeatability of  $\pm 0.08$  mm.

The LEJS high rigidity slider type ball screw drive features a 100 or 200 W AC servo motor, with a wide load mounting platform supported internally by a double-axis linear guide for reduced moment deflection. It comes in three body sizes (40, 63 and 100), with a maximum workload of 135 kg, a maximum speed of 1800 mm/s (H lead), maximum stroke of 1500 mm (2500 mm\*LEJS100), and a positioning repeatability of  $\pm 0.02$  mm.

The LEY rod features a 100, 200, 400 or 750 W AC servo motor, with a range of body sizes (25, 32, 63 and 80). The LEY rod electric actuator has a maximum workload of 200 kg (horizontal) and 115 kg (vertical), with a maximum pushing force of 3343 N, and maximum stroke of 800 mm. It also has a positioning repeatability of  $\pm 0.02$  mm.

The LEYG Electric Actuator features a 100 or 200 W AC servo motor, with either 25 or 32 body size. It has a maximum workload of 60 kg (horizontal) and 46 kg (vertical), a maximum pushing force of 736 N, a maximum stroke of 300 mm and a positioning repeatability of  $\pm 0.02$  mm.

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# Unlocking the value in food organics

**F**ood waste, as well as its treatment and disposal, is becoming more topical across the Australian political and public landscape. The Rabobank 2019 Food waste report identified that food waste costs Australians \$10bn annually. Of course, the approach to tackling the problem is to avoid the generation of organic waste in the first place, but once it's generated, education and suitable food waste treatment are key. With the right technology and capability, organic waste can provide numerous circular economy and climate resilient outcomes.

Australia is slowly seeing stronger policies coming into place to increase the amount of organic waste going into landfill. As an example, Victoria's recently released 'Recycling Victoria' strategy included a \$129m package for kerbside waste collection reform, with a target for 100% of households having access to a separate food and organics recovery service or

composting by 2030, as well as halving the volume of organic material going to landfill by 50% between 2020 and 2030.

As a leading environmental solutions organisation, Veolia Australia and New Zealand welcomes this trend. "Organics recovery is firmly part of our business strategy to 'Resource the World'. For Veolia, it is not only about landfill diversion, but importantly, it's also about improving soil health, which is extremely relevant in our Australian context," said Laurie Kozlovic, Chief Innovation and Strategic Development Officer, Veolia ANZ. Carbon storage in soil offers a host of ecological benefits such as release of nutrients, water retention, and absorption of organic and/or inorganic pollutants. Its sequestration also supports other ecosystem services derived from soils, such as farming production, drinking water supply and biodiversity, by increasing the amount of organic matter in the soil and thus improving its quality.





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In Australia, Veolia operates a comprehensive range of technologies including a number of in-vessel composting facilities as well as an anaerobic digestion facility that produces both electricity and fertiliser. Veolia's compost products are beneficially re-used in a number of urban amenity, agriculture, rehabilitation and environmental remediation applications across the country. Additionally, Veolia collects organic waste from its broad customer base that includes councils and commercial and industrial businesses. This experience also extends to its water business where organics such as biosolids are managed and beneficially re-used.

"Removing organics from landfill crucially reduces carbon emissions, but equally important is the role that compost plays in providing food security, improving soil carbon and crop productivity, and reducing the effects of drought. Organic waste recycling is a great example of how we can

value the inherent properties of waste and keep the materials circulating through the economy." Additionally, Kozlovic said that identifying the waste streams for recovery early on enables the right infrastructure to be developed to provide an integrated and holistic solution, which is crucial for any ambition towards zero waste.

With organics recycling rates being around 52%<sup>1</sup> in Australia, there is ample opportunity for improvement and innovation. "The best outcomes are when customers take ownership of their wastes from a process and recovery point of view. It then becomes a prime partnership for finding optimal solutions together," said Mark Taylor, Head of Solid Waste Treatment, Veolia ANZ.

Veolia's innovations include the Soil Advisor, an app that has been in development internationally for a number of years through Veolia's agronomic hub, to provide farmers with a tool to optimise compost application, by analysing the long-term effect of the compost and its impact on changes to soil organic matter and soil carbon storage. This digital tool supports the international "4 per 1000, Soils for Food Security and Climate" initiative that was launched during COP21 in late 2015. The idea being that a 4% annual increase in the amount of carbon in all soils worldwide would compensate for all human-induced greenhouse gas emissions.

Another example is a mobile, onsite organic digester solution, Iugis, suitable for customers in a range of market sectors. The Iugis technology mimics a natural digestion process, biologically converting organic food waste into liquid trade-waste. Used in a range of operations needing to manage and dispose of organic food waste, this device supports landfill diversion as well as an onsite solution for customers that may be in remote or rural areas, or some distance away from a dedicated composting facility.

As with all waste issues, a systematic and comprehensive approach is needed to deliver meaningful outcomes. Veolia is ready to work further with governments, businesses and communities to convert the various organics policy ambitions, as well as their customer objectives, into practical and relevant solutions. However, Veolia said it needs all stakeholders to work together to create the framework and conditions necessary for the actions to be successful, "Veolia will invest; however, we need stable and reasonable policy, regulatory and contractual conditions. In doing so it will enable long-term and sustainable investments which are value creating for all partners," said Head of Solid Waste Treatment Mark Taylor.

For more information visit [veolia.com/anz](http://veolia.com/anz).

Veolia Australia and New Zealand  
[www.veolia.com.au](http://www.veolia.com.au)

<sup>1</sup> National Waste Report 2018

## CASE STUDY

# Enhance the flavour of your snacks with the SolidFlow mass flow meter

Everybody likes snacks, lollies, peanuts, crisps, ... while watching your favourite movie, rugby or football. Right? What's better than that to serve our brain with a serotonin bump? But when it's too salty or too sweet, the reverse happens, resulting in consumer rejection. This is definitely not what the producer wants! Every factory wants to nail the tasty point, optimal flavour, ...but how to do it? How do you avoid rejection and ensure customers' satisfaction?

Recipes stick with standards, defined amounts, defined characteristics, repeatability, consistency. Common words for process engineers. What is the key to get all of that? Process control, something which doesn't come in simple steps, higher quality, higher repeatability comes after many small steps and procedures. Processes are usually related to an optimisation cycle, something like planning, doing, controlling and acting. In Industrial Automation, the Control and Actions are mostly connected. A basis for control is measurement, without measuring how can control be possible?



### Crisp case study example

Nowadays measuring solutions are affordable to the majority of industries. That's why a medium-sized food producer has decided to improve their crisps' flavour consistency. The existent dosing system was a screw feeder, dropping spice into the crisps transported on a conveyor belt. Two important variables were in question, the spice mass flow and the crisps' moisture.

To blend the spice and the crisps, according to the recipe, it's necessary to maintain 14 kg/h of spice and crisps with 4% moisture content. The moisture content was mostly constant, thanks to the oven's good performance, so the challenge was spice's mass flow.

In perfect scenarios the mass flow should be constant; in real life though, from time to time the spice sticks on to the screw feeder, reducing the output rates. At other times, the dosing system has accumulated material, dropping a bigger quantity at once.

Controlling the screw feeder's speed is possible to adjust according to variations, which can happen while the crisps are produced. If there's more crisps? Less crisps? Definitely the spice dosing should be adjustable. If it's a bit sticky, a mechanical instrument would be terrible, stopping many times during the day. What about non mechanic solution? No moving parts, precise, easy to install and calibrate? Is it possible?

### The solution

SolidFlow is a mass flow meter for dry solid materials of any kind. Its cutting-edge microwave technology allows the sensor to measure without touching the material, which is fantastic for spice. Entirely made in stainless steel, ready for the food industry, an instrument built to last.

SolidFlow was installed in a free-fall section between the screw feeder and the conveyor belt, measuring exact amount of spice falling on top of the crisps. The installation was made by welding the sensor's socket in a very short pipe section in order to concentrate the microwave field, considering the very low flow rate of 14 kg/h.

With 4–20 mA analogue output, it's easy to transfer this information to any PLC. SolidFlow now measures the spice flow rate to the controller, which adjusts the screw feeder speed according to the defined mass flow.

Just some days after installing the sensor it was possible to see improvements in the end product quality, constant mixing rates and the operational team can run the process, calling the maintenance team less often.

Now all they need is a good cup of coffee. Which, by the way, is another great application for SolidFlow! Coffee beans mass flow, to define the right amount to be injected into the roaster. So many things...Solids mass flow measurement, it's now easier to do!

Group Instrumentation Pty Ltd  
[www.groupinstrumentation.com.au](http://www.groupinstrumentation.com.au)





## Hygienic valve sensing and control unit

The Alfa Laval ThinkTop IO-Link is a sensing and control unit for hygienic valves. The IO-link features Industry 4.0-ready communication protocol, to enhance point-to-point communication between

smart hygienic valves and advanced automation systems. This enables smarter valves control due to real-time data exchange, improved diagnostics and simplified configurability and control.

The valve sensing and control units support intelligent manufacturing industries, like the dairy, food and beverage industries, through to home-personal care and pharmaceutical industries. The control units can capture, store, analyse and act upon data, and are easy to install due to their M12 connectors and automatic recording of the hygienic valve stroke duration.

The valve sensing and control units also enable smarter time adjustments because priority can be assigned to critical data, while data and process parameters can be changed from a remote automation system. The product also allows enhanced data storage, availability and analytics to improve operations. The ThinkTop IO-Link covers valve requirements and fits the Alfa Laval DV-ST, butterfly, single-seat, double-seat and special valves.

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## Controllers for vibratory equipment

Electromagnetic drives, both linear and rotary, are commonly used throughout the materials handling industry for accurate metering or orientation of bulk ingredients and parts. Any piece of electromagnetic vibratory equipment has at its heart a controller. While compact in size, it plays a crucial role in ensuring the intensity of vibration can be adjusted to maintain control and flow of the product.

Enmin's range of controllers is available to suit all electrical requirements and includes both manual and automatic models. These range from basic standard controllers to multifunction models that tune to accurate frequency bands enabling high-speed filling coupled with pinpoint accuracy. The controllers are available in differing enclosures or as standalone for incorporation into central panels.

With some 25 circuits available, Enmin's range of electronic controllers will support most applications where electromagnetic vibratory feeders and devices are employed. Standard circuits will accommodate electromagnetic vibratory feeders up to 10 A draw and can be used on any single-phase circuit.

The range can be used on any type of linear or circular vibratory feeder and is designed to conform to ISO 9001, IQNET and CSQ standards. According to the company, the Enmin controllers are also compatible for use on some other suppliers' equipment including electromagnetic bowl feeders, linear drives and bin vibrators.

Enmin's range of product handling and vibratory equipment includes the Mi-CON modular conveyor, hopper feeders and screeners, spiral conveyors, conditioning conveyors and more.

**Enmin Pty Ltd**

[www.enmin.com.au](http://www.enmin.com.au)



## X-ray system

The Ishida X-ray inspection system is designed to help food manufacturers and processors comply with global safety standards and meet the demands of quality and safety-conscious retailers. It is designed to provide vital information with accuracy and reliability that can alert users when foreign bodies are contaminating their product.

The IX-EN series is able to provide a high level of quality assurance to processors and manufacturers and is suitable for various applications. Using the latest technology, the system helps provide precise and reliable inspection with a low investment cost.

A good entry-level X-ray system for uniform products, the IX-EN-4062 performs inspection for basic level applications with a lower voltage X-ray tube, providing a good return on investment without compromising on accuracy.

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## CASE STUDY

### Integrating big data in the food and beverage industry



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The food industry is becoming increasingly data-driven, with smart sensors widely used across industry applications, providing insight into processes and allowing manufacturers to collate more data for analysis. Having more data can be helpful, for example, if smart sensors alert an operation manager of a failing motor before it is in a critical state. This provides more time for users to create a plan of action that minimises downtime and overall disruption. However, maintenance is only one aspect of this development.

While harnessing data across the facility can support many aspects of manufacturing, ranging from balancing conveyor belt throughput to ensuring continuous optimisation, it can be difficult to discern which data streams to pay closer attention to.

Computers and data processing software can discern trends and carry out deep analysis to support those in production environments. However, the computerised systems cannot understand exactly who to send the data to; consequently, it helps to have specialists to ensure the correct person is receiving the right information at the right time.

The ABB Ability Collaborative Operations Platform analyses data, with specialists to look over a site's industrial data and packaging the information in a way that benefits the consumer. The platform provides businesses with access to specialists that they may not have in-house, such as cybersecurity.

In typical applications, ABB customers reported an 84% improvement in asset reliability over four years and a \$22 million reduction in maintenance costs, alongside improved process availability, better throughput and improved safety. Having a system in place prevents businesses from becoming overburdened by information and ensures that those in the relevant roles receive necessary information.

Those in the food and beverage industry must keep up with the competitive landscape, by integrating big data and connectivity and using it to achieve actionable results. Manufacturers ensuring that production systems are making the most of industrial data can improve production efficiency.

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## NEWS



### Disinfection system for delivery trucks

There's no debate regarding how tough it is for Australian farmers at the moment, with environmental factors putting livelihoods at risk. The last thing any primary producer, breeding farm, food manufacturer or processing plant needs is a bio-security threat.

For smaller producers and boutique operations, the cost of constructing vehicle disinfection facilities can be prohibitive. It can also be difficult to retrofit them. But the Italian manufactured IDA3 manual vehicle disinfection system provides a modular solution that disinfects vehicles entering and/or leaving the premises.

Available from Tecpro Australia, the system operates under low pressure. Trucks and other vehicles simply pass through the system as they enter (or leave) your premises. A series of nozzles spray disinfectant around the perimeter of each vehicle (including the sides up to 1 m high and the chassis).

Its modular design means the vehicle disinfection system can be constructed to fit trucks up to 3 m wide. It's easy to put together — requiring only a screwdriver and spanner — and includes a pump, galvanised steel platforms, spray nozzles and stainless steel enclosure to house the pump and electrical panels. Automatic and customised vehicle disinfection kits are also available.

### Double-deep reach truck

The Mitsubishi EDR18N2 pantograph double-deep reach truck is now available to the Australian market, through MLA Holdings. The truck is designed to increase storage capacity, improve workflow and allow operators to perform tasks more efficiently in double-deep applications.

The reach trucks can be used for single and double-deep applications to maximise the value of warehouse space. Equipped with sophisticated controls, it is designed to enhance the operator's confidence when lifting loads at greater heights.

The reach truck can run up to two shifts on one battery charge, saving operating time and money. All the major components, software, motors and controllers are incorporated into one advanced system for better energy efficiency, productivity and speed.

The reach truck provides good load handling at high lift heights, allowing for accurate work in double-deep racking at heights of up to 11 m. This is due to its design featuring Mitsubishi's ProTrac suspended articulating drive axle, which is capable of distributing load forces equally across both the drive and caster wheels. Consequently, it improves the overall stability of the truck.

Safety features include automatic speed reduction which decreases speed when the truck performs a turn. The automatic parking brake is also designed to engage every time the operator steps off the truck.

The series can achieve good lift and travel speeds without compromising control, helping operators move more pallets in less time. A rigid mast with cushioning at all mast stage transitions enables consistent lifting and transportation of materials.

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## Vertical conveyors and lifts range

Driven by a unique heavy-duty rubber block chain with good strength, the NERAK vertical conveyors and lifts range from Esko Australia are space-saving, quiet, durable and high-performance solutions for a user's vertical transport requirements. The rubber block chain is maintenance-free, stretch-free, lubrication-free, corrosion-free and abrasion-resistant. The vertical conveyors and lifts transport loads to heights of up to 36 m, and in temperatures as high as 138°C and as low as -45°C.

NERAK conveyors are easily integrated in automated system applications that require lifting of boxes, cartons, packages, totes, containers, cases, pallets, bags and many other unit goods. Esko Australia offers a wide range of vertical unit load conveyors that are engineered to meet users' project application requirements.

Continuous Vertical Conveyors (CVCs) are designed to convey product in high capacity between two levels (up or down), on a minimum footprint. The CVCs are a space-saving alternative to spiral or inclined conveyors. They maintain the horizontal product orientation and are suitable for a variety of products, including boxes and cartons, trays and totes, and kegs, rims, tyres or bags.

Vertical Reciprocating Conveyors (VRCs) (reciprocating lifts) are designed to elevate products in multi-level applications, with high flexibility. For increased throughput, configurations with multiple belts on the hoist are available, either side by side or stacked.

Vertical Circulating Conveyors are designed for applications where continuous random loading and unloading at multiple levels with high capacity is required, enabling separate loading and unloading on each floor.

Vertical baggage CVCs and VRCs transport baggage from one level to another, offering a space-saving solution for high-capacity vertical transport through multi-level airport terminals and train stations.

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# Power protection

## in the beverage industry

John Young, EU Automation

**While bacon and eggs work well together, electricity and liquids are not a match made in heaven. Yet electronic systems are crucial when handling fluids in a beverage processing plant, so effective power outage management is essential.**

**T**hanks to increased competition and customer demand for greater traceability, today's electricity grids in the food and beverage industry are growing in complexity. When this is combined with augmented automation and a multitude of energy generation sources, it is easy to see that increases in power applications lead to greater efficiency. But what happens when there's an unexpected interruption to the power supply?

### Protecting the power

Power outages cost billions of dollars in lost production, inventory and security. Not only do they threaten companies' bottom lines, they also put worker and consumer safety at risk.

If we attempt to quantify the cost of regular stoppages during the beverage bottling process, the losses are difficult to fathom. Not only would the unexpected downtime lead to lagging productivity, bottles of beverages that are in line awaiting their caps also risk loss. If the contents spill due to a sudden stoppage, product is lost, machinery is potentially damaged and a health and safety hazard is created — all at the hands of even the most minor of interruptions to the power supply.

It's no secret that beverage processes require a large amount of energy. From mixing and blending ingredients to keeping drinks cool and the bottling process, each application consumes a lot of power.

Let's take a closer look at dairy production. Milk demand is on the rise in Singapore, with research from Euromonitor International stating that consumption rose by 12% between 2011 and 2016.

Dairy production is a very energy-exhaustive process, and greater demand ups the intensity. The processing of raw milk involves separation, pasteurisation and homogenisation in order to get the product to a safe, longer lasting and consistent standard. Each of these stages involves intense levels of heating and cooling, producing extensive electric emissions.

The nature of working with raw milk also requires extensive tracking and tracing in order to monitor critical factors such

as temperature, the transfer of the raw milk into a pasteurisation vessel or milk powder being transported from a spray dryer into a silo. This is typically monitored by a process control system but, if the plant loses power, the program risks interruption. If the system is unable to record this data, the safety of the product cannot be guaranteed and it may have to be discarded.

### Building a safety net

There's no use crying over wasted milk. To protect a beverage processing plant from power outages, manufacturers must put several safety layers into place. The first is a traditional hazard and operability (HAZOP) analysis, which allows plant managers to identify what could potentially go wrong during an unexpected outage. This study should be regularly backed up by plan-do-check-act (PDCA) procedures to continuously monitor and improve processes and equipment.

The second layer is an uninterruptible power supply (UPS). As a widespread method of power management, a UPS contains a battery that kicks in when the device senses a loss of power from the primary source. This allows the UPS to keep any affected units powered until they can safely shut down. Plant-wide UPS backup is also available to protect an entire supply chain from outages.

Another aspect of outage protection is an outage management system (OMS) — software that can be embedded into a supervisory control and data acquisition system (SCADA) to provide a real-time view of a plant's power. By giving safety engineers an immediate and schematic view of the power system, they can quickly identify faults and speed up reconnection efforts for affected areas.

Proper preparation prevents poor performance — but even with the most stringent plan in place, these protections can fail and damage is unavoidable. In this case, the third layer of protection comes into action by working with a part supplier, such as EU Automation, that can supply the components needed promptly anywhere, any time that it is required.

In beverage manufacturing, a steady supply of power is crucial to many applications. Without a continuous and reliable power system, product can be lost, rendered unsafe and cause hazards for employees. To mitigate the effects of a poor outage management system, preparation is key. With these layers of power management working in unison, liquids and power can work in harmony.

EU Automation  
www.euautomation.com



## CASE STUDY

### Improving tomato yields with new AI-enabled service

NEC Corporation is partnering with Australian tomato processing company Kagome to launch an agricultural management support service using artificial intelligence (AI).

The new service uses NEC's AI-enabled agricultural ICT platform, CropScope, to visualise tomato growth and soil conditions based on sensor data and satellite images, and to provide farming management recommendation services. The AI technology enables the service to provide information on the best timing and optimal amounts of irrigation and fertiliser for the cultivation of healthy crops. As a result, farms are able to achieve stable yields and lower cultivation costs, while practising environmentally sustainable agriculture without depending exclusively on the technical skill of individual growers.

By using this service, tomato processing companies can obtain an understanding of the most effective growing conditions for tomato production on their own farms, as well as their contract growers. Also, they can manage crop harvest orders across all fields in an optimal way based on objective data, which helps to reduce yield loss and improve productivity.

NEC and Kagome began collaborating in the agricultural field back in 2015, and by 2019 they had conducted demonstrations in a variety of regions, including Portugal, Australia and the United



States. An AI farming experiment in Portugal in 2019 showed that the amount of fertiliser used for the trial was approximately 20% less than the average amount used in general, yielding 127 tons of tomatoes per hectare, which is approximately 1.3 times that of the average Portuguese grower, and almost the same as that of particularly skilled growers.

With the goal of commercialising this service, Kagome will establish a Smart Agri Division in April 2020, first targeting customers in Europe, then aiming to expand the business to worldwide markets. As a promising market of the future, trial services of tomato production in Japan are scheduled to take place in 2020.

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# Technology could help to reduce salt in processed food

Salt has typically been used at high levels in processed food to improve taste and preservation, but excess salt consumption has been associated with health risks such as high blood pressure. As a result, Australia food manufacturers have been working towards finding solutions to reformulate processed food using less salt without sacrificing the benefits.

Now a new processing technology developed at Washington State University (WSU) claims to be able to do just that. Called microwave assisted thermal sterilisation (MATS), the technology could make it possible to reduce sodium while maintaining safety and tastiness.

The researchers used mashed potato with three flavour variations — no additional flavour, garlic and pepper — to test the technology. The WSU researchers found that the MATS processing, which uses microwave technology to kill any pathogens in food, doesn't reduce the flavour intensity of other ingredients. As a result, the researchers demonstrated that a 30–50% reduction in salt could be possible for the processed food.

The study compared mashed potatoes cooked fresh and using MATS to the current method of food processing preservation — called retort — which reportedly does reduce flavour intensity.

Using a tasting panel and WSU's e-tongue, the impacts of reducing salt and the level of intensity of other ingredients (pepper and garlic) were measured.

"The intensity of pepper is the same in MATS and in fresh potatoes, but is reduced in retort processing," said Carolyn Ross, the lead author of this paper. "The heating process of retort, which takes longer to get up to temperature and longer to cool off, changes the texture and flavour of food. MATS is much faster, so it doesn't have nearly as big an impact on those areas."

If flavour intensity of pepper remains high, then not as much salt is required to make the food palatable, or tasty, Ross said.

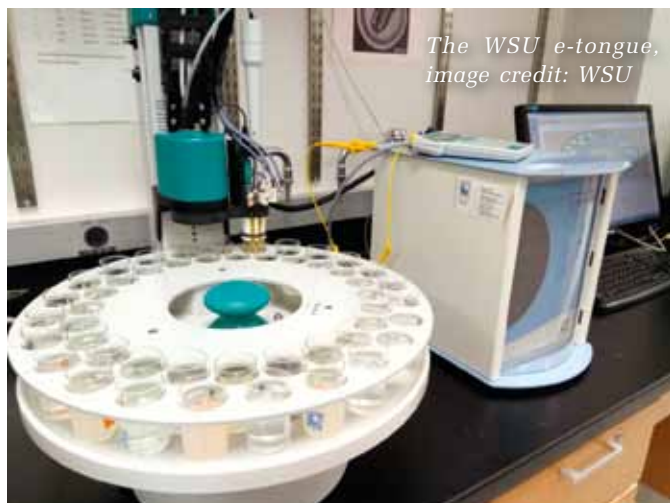
The researchers found that MATS-prepared mashed potato could have up to a 50% reduction in salt and it was still enjoyed by the tasting panel.

"They could tell it wasn't as salty, but they still liked it because the flavour intensity of other ingredients was higher," said Ross, a professor in WSU's School of Food Science. "Basically, if you can enhance the flavours of herbs, the food still seems salty enough to be enjoyed."

The MATS technology is still relatively new, but Ross thinks it could go a long way to helping reduce the salt used in processed foods.

"We have to make a product that people want to eat," she said. "And there are a lot of older adults that eat prepared meals because of convenience and safety. So if we can reduce salt intake from those foods, and still have pleasant flavours, it could be hugely beneficial."

The researchers included WSU's Sasha Barnett, Shyam Sablani and Juming Tang, and the study was published in the *Journal of Food Science*.



*The WSU e-tongue,  
image credit: WSU*





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# Pallet racking solution protects against forklift impacts

**Forklifts perform a vital function in warehouses across Australia, yet collisions with pallet racking within these settings also cost the storage operations sector tens, if not hundreds, of thousands of dollars per year. Rack Armour aims to offer a “simple superior solution to pallet racking protection”, Karen Varian of Rack Armour Australia (RAA) said.**

**T**his pallet racking protection solution features a shock deflector that is made from a tough polymer designed to withstand significant impact. A feature of the armour is its persistence of shape, which is intended to provide ongoing protection as the unit reverts back into its original form, with curved edges that deflect the impact away from the rack face.

Rack Armour includes an inner foam that acts as a shock diffuser, reducing inertia from any impact and diffusing the force along the whole length of the unit. Any residual impact is therefore dissipated over a larger area, making it less likely to cause damage to upright racking. The solution is Australian made and has undergone independent engineered testing. Such testing was performed to validate the energy absorption characteristics of Rack Armour when subjected to an unintentional impact from a forklift. RAA's intention is to provide customers with a product that contributes to providing a safe work environment, protecting staff as well as company assets.

The pallet racking solution is designed to provide ongoing protection in both dry and cool room storage environments, meaning it is effective to the majority, if not all, of warehousing applications. It is claimed to be resistant to acid, alkali, mould and most solvents, will not rust or corrode, and is effective down to -40°C. “It has been a great experience seeing the difference the Rack Armour product has made,” Varian said, “providing relief to customers in ongoing costs of repairs

and maintenance due to rack damage caused by forklift operation. The amount of companies throughout Australia who are unaware that there is an alternative to traditional pallet racking protectors is concerning. If a product or application is not performing to the customer's expectations, they should endeavour to source one that does, and that is where Rack Armour can certainly help.”

Rack Armour is manufactured from materials that include ballistics grade 100% polymer, which allows it to revert back to its original form after impact. It also complies with the relevant Australian Standard — AS 4084-2012 *Steel storage racking* (Clause 2.4.1) — which states that “accidental actions are defined as impact actions which are more severe than those which occur under ordinary ‘good practice’ operating conditions”. Installing Rack Armour on intermediate pallet racking uprights throughout a facility, RAA claims, mitigates damage caused by forklift impacts. In turn, it is also claimed that this minimises the likelihood of falling pallet racking, damaged uprights, bay downtime, as well as ongoing costs to maintain a safe work environment.

“With the coronavirus pandemic impacting countries across the globe, Australia-based manufacturing is becoming increasingly crucial to the economy,” Varian said. “Additionally, with the Commonwealth Government restrictions and delays, many businesses are now needing to re-evaluate supplier options and take a serious look at what local products are readily available. Further to this, according to the recent announcement from the Australian Government, there is a proposal to increase the instant asset write-off threshold from \$30,000 to \$150,000. This applies from 12 March 2020 until 30 June 2020, for new and second-hand assets first used, or installed ready for use in this timeframe. Refer to [www.ato.gov.au](http://www.ato.gov.au) for further information.”

RAA is based in Chipping Norton, New South Wales, and has a growing network of resellers throughout Australia. The company exports to New Zealand and South East Asia.

*Rack Armour Australia Pty Ltd*  
[www.rackarmour.com.au](http://www.rackarmour.com.au)



## CASE STUDY

### Robotics made easier for food and beverage applications

SMC has added to its portfolio the Wireless Fieldbus System EX600-W, which is being used for applications in the food, beverage and packaging industries. Designed to make robotic applications easier, the decentralised fieldbus solution is EtherNet/IP and PROFINET compatible.

In a recent Australian application, SMC collaborated with SunRice (Ricegrowers Limited) — an Australian company with a footprint in 50 countries. SunRice welcomed CopRice to its portfolio more than 40 years ago; CopRice manufactures and supplies quality livestock feeds. The manufacturing process includes rice broken, rice bran and rice hulls, which are supplied through the rice milling process.

CopRice's primary Robotic Palletiser is crucial to its business. Used daily, the 500 kg payload robot is fitted with a SAS Fork tine gripper to pick and place stock feed SKUs. With various sized bags needing to be palletised, the gripper tines had to be in different positions when picking up these bags to ensure that the best-quality products are stacked onto pallets for customers.

In terms of the application, the robot gripper needed to adjust the gripper tines automatically for each SKU as it was being palletised. The problems that it faced in the past were a limited number of inputs and outputs, expensive fieldbus modules and failed solutions due to vibrations on the gripper.



esstock.adobe.com/au/abdomax

Ricegrowers Engineering partnered with SMC to develop a customised solution for CopRice. SMC's wireless fieldbus system — the EX600-W — was specifically specified and customised for this application. The customer has reported that the solution was easy to install and they received good technical and sales support.

According to Ming Liu, Head of Product and Pricing Group at SMC Corporation ANZ: "This wireless fieldbus system can manage both digital and analog signals, as well as pneumatic products, making it a flexible solution for all applications.

"The EX600-W is small and lightweight, fits onto the robot head, has minimal wiring, offers remote control and fault finding, among other features," he continued.

The product is also compliant with the all applicable Australian Communications and Media Authority (ACMA) requirements and has been registered to use the regulatory compliance mark (the RCM) in AU and NZ.

The product won the award for Technical Innovation of the Year at the 2019 Motion Control Awards in the UK.

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## CASE STUDY

### Lactalis automates the handling of its milk pallets

Dematic has helped Lactalis Australia to achieve increased productivity at its Lidcombe Milk Site in NSW, with the rollout of a new automated guided vehicle (AGV) solution.

Lactalis Australia (formerly Parmalat) is owned and operated by the Lactalis Group, a third-generation, French family-owned business. Its Australian operations date back to the original Pauls milk business, which has been running since 1932. Locally, Lactalis has 2500 employees who work closely with up to 500 Australian farmers.

“One of Lactalis’s key goals [is] to invest in and grow the Australian dairy industry, as well as to promote Australia as a high-quality producer for the Asia-Pacific region,” said Kristian Brennan, National Logistics Optimisation Manager at Lactalis. “To support this growth, Lactalis is always looking for new ways to improve our operations by boosting efficiencies and productivity.

“The new AGV solution has successfully helped us to significantly increase productivity at our Lidcombe site, as it allows us to run a faster operation 24 hours a day, seven days a week.”

The AGV solution chosen by Lactalis, Dematic’s Counterbalance Series AGV, manages the transportation of pallets of milk at the Lidcombe site and is capable of lifting loads of up to 1.2 tonnes to a height of 6 m. The AGVs are well suited to working at the site, which is a chilled environment that has a temperature of 2 to 4°C.

Four AGVs work to retrieve pallets from an inbound conveyer system from production, and then feed the pallets into an order buffer, releasing the pallets at a declined angle



onto pallet live storage racking. They operate in a small space and manage tight traffic at high speeds of up to 1.7 m/s.

The AGV solution’s accuracy and safety around workers and any obstacles is ensured through sensors and laser scanners that help them navigate with precision. The AGVs are powered by lithium-ion batteries and can drive themselves onto charging floor plates at times of inactivity and be fully charged in 2 h.

“The need to optimise productivity and reduce costs in food and beverage supply chains has never been greater,” said Tony Raggio, General Manager AGVs at Dematic. “We’re excited to see Lactalis Australia has increased its productivity, while also being able to receive a good ROI from its investment in Dematic AGVs.”

*Dematic Pty Ltd*  
[www.dematic.com.au](http://www.dematic.com.au)







## Green bean pre-snip sorting solution

Key Technology, a member of the Duravant family of operating companies, has introduced a new concept for sorting green beans prior to snipping.

The Key Technology VERYX integrated sorting system is designed to separate hard-to-snip from easy-to-snip green beans to improve snipping efficiency, which increases case recovery and reduces the cost per case. The solution also removes foreign material (FM) and other plant waste before the snippers, which improves product quality and consistency. All this is done with less equipment than has traditionally been required, which simplifies processes and frees up floor space.

The system combines Key's Iso-Flo shakers, a Rotary Size Grader (RSG) and a VERYX digital sorter to separate incoming product into four streams. Two streams go to waste and two 'accept' streams lead to further processing. One 'accept' stream is dedicated to green beans that are difficult to snip, which go to downstream equipment that is optimised to snip this type of product. The other 'accept' stream takes field-snipped and easy-to-snip green beans and leads to downstream systems designed specifically to handle these green beans.

Prior to this development, green bean processors have not separated incoming product into streams — instead, everything has been sent in one mass flow to the rotary snippers after upstream pre-cleaning equipment. When hard-to-snip green beans are comingled with easy-to-snip green beans, downstream systems are set to handle the hard-to-snip beans. When easy-to-snip green beans are aggressively snipped, good product is lost. Also, when snippers get FM, it's cut into smaller pieces, which exacerbates contamination.

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# Smart tech

## helping manufacturers safeguard supply chains

*Danielle Daddello, Country Manager AU at Unleashed Software*

**T**he first three months of 2020 have been marked by increasing hurdles and pressure for food manufacturers — first, reports signalled food recalls were on the rise, with mass pesto recalls through to mouldy doggy snacks igniting fire about food manufacturing processes. And today, the food industry is watching the business effects of COVID-19 take hold, with new impacts on the supply chain and everyday practice taking hold each day. With this in mind, it's time for an upheaval in the way food manufacturers use technology and supply chain processes, both to keep food on the shelves and to remain resilient when massive supply chain disruptions like COVID-19 start hitting businesses.

Supply chain health is critical to the smooth running of food businesses, and customer satisfaction and safety, but at their core, supply chains can become unlinked. For example, a poorly monitored supply chain point can see food products contaminated early on in the manufacturing process, only to hit consumers when it's too late. And, the ripple effects of coronavirus are hitting supply chain processes hard, with many overseas warehouses and manufacturing sites slowing down or ceasing production.

Cloud inventory management software and smart tech is providing food manufacturers and retailers with newfound visibility into all points of their supply chain and product journeys, to not only help them prevent food recall events, but to better bounce back when unforeseen challenges affect supply chain sites. Technology is handing manufacturers the power to continue to place consumer safety at the forefront, and rely on trusted supply chain partners to keep things going when times get rough, even when faced with a global pandemic.

### Know your suppliers

When times are good, developing relationships with backup suppliers can be life-saving when times get tough. Having backup supply chain sites means that in times of supply chain breakdown, you can keep business going by adjusting supply chain routes and specifics quickly, without needing to frantically search for new supplier options. Taking the time to really get to know these backup suppliers before you potentially draw on them in the future is also important, because last-minute supplier scrambling can sometimes link you up with untrustworthy or overpriced suppliers who can hang you out to dry.

As the business effects of COVID-19 worsen, the most at-risk Australian food businesses should set their sights on



suppliers based locally, where possible, who are less likely to have operations affected due to coronavirus concerns. In fact, sourcing backup suppliers across varying regions to your usual suppliers can be beneficial, as often supply chain disruptions are caused by regionally specific economic crises, environmental events or political tension. For preventing food recalls, staying afloat during COVID-19 and more, trusted alternative suppliers are crucial.

### Keep agile while maintaining standards and visibility

As they grow and adapt in these times of uncertainty, food manufacturers need to take into account increased regulatory requirements, which often demand manufacturers update their ingredients, supply chain points and dispatch processes to fit revised food safety concerns. The food processing supply chain is long and complex, with many opportunities for potential contamination and multiple points for products to be sent out to different consumer end-points.

COVID-19 adds an extra challenge here, where biosecurity concerns and staff shortages have left international processing ports unable to process shipments and deliveries of food items. Cloud-based tools are particularly useful here as manufacturers can receive real-time updates on where their goods are at all times, and ensure nothing gets lost or compromised along the way. And preventing food recalls can go

hand in hand. Manufacturers can use tech to have a clear idea of where their stock is, and its status, at every step in the production process. This helps reduce the chances of recalls in the first place, and when recalls do happen, smart supply chain tracking makes it easier to identify where production mishaps occurred.

### Smart tech as a safeguard

While we can't often predict food recall instances or catastrophic events like we're seeing with COVID-19 today, we can enact preventive steps through cloud inventory management systems to help manufacturers of all sizes react quickly if a recall or supply chain breakdown occurs.

Food manufacturers using smart tech are at a significant advantage — offering greater insight into their supply chains to help them bounce back and keep things running smoothly when contaminated stock hits the shelves or stock yet to be delivered is stalled and threatened. As regulations tighten and COVID-19 teaches us how vulnerable our supply chains can really be, these are just some of the ways smart technology is transforming the food production process for manufacturers, retailers and consumers themselves.

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## Pallet racking upright protection

Rack Armour's pallet racking upright protection is designed to minimise damage caused by forklift and warehouse operations. Manufactured locally, the Rack Armour range is made from high-quality materials and has a patented ergonomic design. Rack Armour is designed with features and benefits to help clients reduce costs in pallet rack repairs, maintenance and downtime.

The Rack Armour range is designed to maintain its performance in cold stores, in temperatures as low as -40°C, without rusting or corroding, making it a suitable alternative to traditional steel protectors.

The range does not require bolts, thereby eliminating potential damage to flooring and make good costs associated with bolted protectors. Rack Armour offers clients the option to self-install using their installation tool or can provide quotes for professional installers.

**Rack Armour Australia Pty Ltd**  
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## Diesel or dual-fuel counterbalance forklifts

Australian materials handling company Adapталift Group is backing the new Hyster UT and Yale UX Series lift trucks to provide a new range of forklifts suited to lower frequency applications typically limited to 1,000 hours a year.

The Adapталift Group were appointed as one of Hyster-Yale's Yale dealers in Australia in 2018; the Yale UX Series provides an opportunity for the company to cater to key markets with lower-intensity usage forklift demands.

The Hyster UT Series and Yale UX Series diesel or dual-fuel counterbalance forklifts, pallet trucks and stackers, in six different capacities from 1.5-3.5 tonnes, provide a range of options for consumers who require quality materials handling equipment – backed by service provided by the dealer network – but don't need advanced functionalities for their tasks. Adapталift Group offers both the new Hyster and Yale lift trucks, adding to their fleet of approximately 10,500 units across Australia, backed by a workforce of more than 400.

The new ranges provide a simple approach to materials handling which is suitable for consumers whose materials handling equipment is required to work intermittently over a working week, on an as-required basis, typically up to 1,000 hours a year.

The forklifts come with 3-piece overhead guard, comfortable seats and an access step. The forklifts will be comprehensively backed in the field by Adapталift, including an extended drivetrain warranty, full service and parts support.

The range of forklifts is customised to consumer needs, such as varying hours of service, different applications, capability, strength, and cost of ownership. Hyster-Yale has a long-established professional dealer and service network extending across Asia-Pacific, such as the Adapталift Group.

The forklifts provide intelligent design, product testing, quality of manufacturing and quality of suppliers to consumers, and can be adapted to suit consumer requirements.

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## 3D localisation with the Belt Pick SensorApp for pick-and-place tasks

The ability to ensure hygienic primary packaging of sensitive open food is incredibly important within the food industry. This is why SICK is working with the robot manufacturer Stäubli to make this process possible within a robot cell. The TriSpectorP1000 3D vision sensor from SICK and the four axis FAST picker TP80 HE from Stäubli solve picking processes while the conveyor belt is in motion. 3D parts localisation is implemented by the Belt Pick SensorApp and SICK AppSpace. In case studies, shrimp or biscuits were successfully sorted in packaging trays.

Both the food and pharmaceutical industries have extensive requirements when it comes to sorting and orientating small objects in a hygienic packaging process. By working in partnership with Stäubli on a pilot project to sort shrimp using the FAST picker TP80 HE while the conveyor belt is in motion together with the programmable TriSpectorP1000, SICK is opening up a diverse range of applications.

From salad to cookies to sausages, the TriSpectorP1000 is capable of handling a whole host of different tasks. The 3D technology is particularly ideal for objects of irregular size and variable height, as well as for double layer detection. Together with an encoder, the sensor is capable of detecting each individual object both accurately and reliably. Once the position of an item has

been recorded on a three-dimensional basis, the exact coordinates are passed on to the FAST picker TP80 HE. Its vacuum gripper then removes the shrimp from the belt one by one and places them in the trays according to a specified packing pattern. The four axis robot arm can typically handle over 200 picks per minute. This particular application does not require maximum speed, yet the robot is still capable of sorting over 60 shrimp a minute.

The TriSpectorP1000 records the position of the products by means of a laser triangulation process, which also calculates their height and volume. This is particularly significant when packaging organic products, as their sizes tend to vary. Furthermore, the ability to calculate volume makes it possible to reject shrimp that are too small in this particular application. The FAST picker TP80 HE also uses this measurement data to achieve a visually appealing presentation within the tray and ensure a standardized packaging weight.

### The future looks bright: tailor-made 3D vision solutions with SICK AppSpace

It's all a matter of perspective: The 3D localisation capability allows the robot to detect the spatial position of an object as part of a sorting task, regardless of the contrast situation. It can even prevent collisions with the object thereby avoiding any resulting damage.

SICK offers tailor-made 3D vision solutions for flexible automation: SICK AppSpace is an ecosystem of software tools and an expanding number of programmable devices based on technologies such as 2D and 3D vision, RFID and LiDAR. By using the application programming interface (API) functions, so-called SensorApps are developed.

The SICK Belt Pick Toolkit is a SensorApp specialised for locating products on a conveyor belt which is also in use here in cooperation with Stäubli. With this piece of software installed, the camera turns into a 3D belt-picking sensor. This also offers excellent prospects for the future: No matter whether the task involves sausages or medication, product changeovers require virtually no adjustments — if any at all — as long as the mechanical dimensions are similar. Conversions such as these couldn't be easier with the TriSpectorP1000, as they are all handled automatically and digitally using SICK AppSpace to make the entire process of handling packaging lines more efficient all round.

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# The food fraud challenge

## Prevention and mitigation of the risk of food adulteration

**Foods of a certain origin or production method are becoming increasingly popular. Extra virgin olive oil, beef from Argentina, Parmigiano Reggiano, Jamaican Blue Mountain coffee, Manuka honey from New Zealand or Cabernet Sauvignon from South Africa are some of these examples. With an organic seal on the label, consumers may be more willing to pay a premium.**

International operations such as OPSON have repeatedly demonstrated that premium and even mass products are being counterfeited and marketed on a large scale. Counterfeiters often take advantage of the complex international supply networks, as was shown in the horse meat scandal in 2013.

Food adulteration can have many different manifestations, so what exactly is food fraud?

Food fraud is a deliberate violation of food law, whereby an economic gain is achieved by deceiving consumers. Four key criteria must be met:

- Infringement of the law
- Intent
- Economic advantage
- Consumer deception

Opportunity lies in the heart of food fraud. A fraudster recognises the opportunity, evaluates potential obstacles, for example, in the form of laws, controls (probability of detection) and possible penalties and maximises their own advantage, which ultimately leads to the victim's disadvantage. A fraudster does not necessarily have to be an individual; the past has shown that the actors behind food fraud are often many, organised in crime networks. The victim does not necessarily have to be an individual either.

A company can also become a victim if it unintentionally buys counterfeit goods and processes them into its products; figure 1 illustrates the interrelationships.

On an international level, the terms may differ to a certain extent. What is understood in Europe as "Food Fraud" is called "Economically Motivated Adulteration (EMA)" in the US and needs to be distinguished from "Intentional Adulteration (IA)". The latter includes, for example, antibiotic residues (food safety), as these were administered to the animal intentionally.

To avoid confusion, it is also useful to distinguish the term food fraud from other infringements of food law. These can be divided into the four categories Food Quality, Food Defense, Food Safety and Food Fraud (Food Risk Matrix, Spink, et al., 2011). Infringements in the various categories differ in terms of the motivation of the actor and their intention.

### **Food quality:**

Maximisation of profit is the motivation to achieve high food quality — infringements in this area are accordingly unintentional.

### **Food safety:**

In this case, the motivation is to avoid any damage to the health of the consumer. Since infringements represent an economic loss for the person placing the product on the market, cases in this category are also unintentional.

### **Food defense:**

Food Defense is concerned, among other things, with protection against damage to health and economic interests. In contrast to food safety, however, it is based on an intentional act, such as that underlying blackmailing or terrorist acts.

### **Food fraud:**

Here the motivation is to maximise profit, but not by maximising product quality at the same time, but by dishonest means. Thus, there is an intentional act that results in financial damage to the defrauded. Most cases result only in financial damage, but in some cases, food safety may well become an issue, such as the adulteration of baby food with melamine that occurred in China a few years ago.

### **Which matrices are affected?**

Wherever there is an opportunity to increase profits while the probability of being caught is low, adulteration in one form or another is to be expected. Available 'food fraud hit lists' differ





Figure 1: Food crime triangle.

slightly depending on the database used. Mostly, however, the same foods are found in the top 10, although occasionally in a slightly different order.

The most common adulteration is the replacement of a valuable ingredient. Examples are syrup in honey or foreign oils in olive oil. Another type of adulteration is masking of defects on fresh fruit by means of (possibly harmful) dyes.

Other examples of adulterations are:

- Intentional mislabelling, such as changing the best-before date or even organic labelling on conventionally produced products.
- The sale of overproduced goods through unauthorised methods (eg, when a fishing quota is exceeded).
- Artificial modification of quality-determining parameters with harmful substances, as in the melamine scandal some years ago.
- Counterfeiting of a well-known premium product, often with protected designation of origin or indication of geographical origin, with low-quality raw materials or raw materials of other origins.

A comprehensive overview of food fraud and definitions in this area is provided by the CEN Workshop Agreement (CWA) 17369:2019.

### How can I protect myself?

The range of adulterated products is very broad. Often comparatively high-priced products are affected, but nevertheless products from large-scale production should not be disregarded.

First of all, it is necessary to be aware of the current situation in an objective manner. This is best done through a vulnerability assessment (VACCP, Vulnerability Assessment Critical Control Point). In Europe, companies that are certified according to IFS, BRC or comparable standards have to do this anyway, as it is required by the food standards.

In the vulnerability assessment, various steps of the supply chain and also internal processes are examined and evaluated with regard to the probability of an adulteration occurring. In

this way, vulnerable points can be identified, for which a mitigation strategy is then developed and implemented. This strategy can include, for example, an increased number of audits of suppliers or the testing of products by laboratory analysis.

Within the scope of VACCP, products are evaluated with regard to a possible probability of adulteration, and the use of databases which contain data on known cases of food fraud and also other information can facilitate VACCP.

It is important to note that vulnerability assessments are not single events, they rather have to be carried out on a regular basis.

### How do laboratory analytics support?

The analytical proof of authenticity or adulteration is usually very demanding, as in many cases it is not known how and with what the product has been adulterated. More obvious adulterations can even be detected by sensory means, eg, smell and taste.

But usually this is much more complex.

The TCF<sup>2</sup> has a global network of Tentamus laboratories, which employ the latest technology and necessary know-how to answer questions in the field of food fraud by means of state-of-the-art analysis. Various techniques are used for this purpose:

#### Isotope ratio mass spectrometry (IRMS):

This technique is used to determine the ratios of different isotopes. Commonly the isotopes of carbon (<sup>13</sup>C/<sup>12</sup>C), hydrogen (<sup>2</sup>H/<sup>1</sup>H), nitrogen (<sup>15</sup>N/<sup>14</sup>N), oxygen (<sup>18</sup>O/<sup>16</sup>O) and sulfur (<sup>34</sup>S/<sup>32</sup>S) are used for this purpose. Comparison with reference samples allows for differentiation of geographical origins, eg, for vegetables. It is also possible to distinguish organic products from conventionally produced products (eg, pork, beef, vegetables). The carbon isotope ratio allows conclusions about adulteration of honey with corn or sugar cane syrup. It is also possible to distinguish natural vanillin from the vanilla pod from biotechnologically or synthetically produced vanillin.

#### High-resolution mass spectrometry (HRMS):

High-resolution mass spectrometry, usually coupled with liquid chromatography, also allows the analysis of a large number of

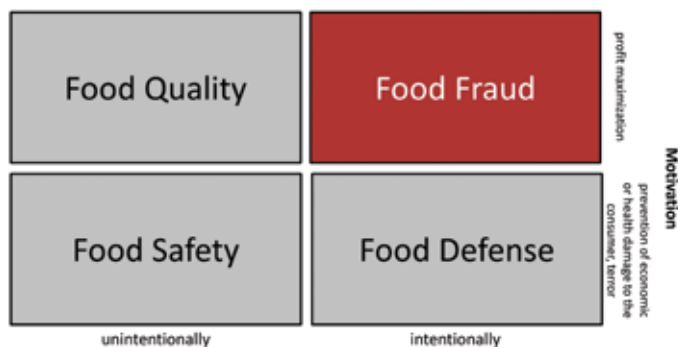


Figure 2: Food Risk Matrix according to Spink et al., 2011.

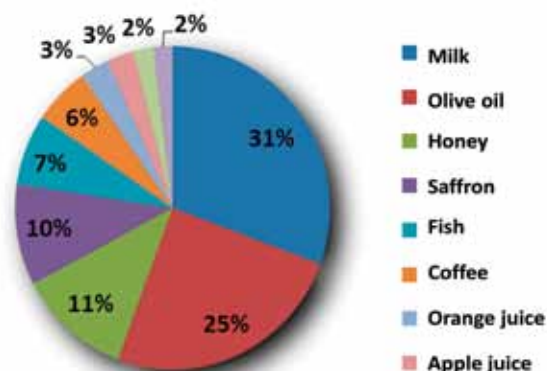


Figure 3: Food fraud hit list of the most frequently adulterated food, based on data from the USP Food Fraud Database (now Decernis).

different substances that provide a sample 'fingerprint'. Comparison with reference samples provides insight in possible adulteration of the product. In addition, it is possible to identify adulteration markers using HRMS, which can then be transferred to classical triple quadrupole mass spectrometry (LC-MS/MS). At the moment HRMS is primarily used for honey, but could be used for fruits and oils as well.

#### Fourier-transform infrared spectroscopy (FT-IR):

This technique can also be used to create a 'fingerprint'. A database of different authentic reference samples is used for comparison. Deviations from the reference samples indicate an adulteration. It is also possible to quantify identified substances. FT-IR is used, eg, in the analysis of milk.

#### Next generation sequencing (NGS):

This molecular biological method makes it possible to analyse the DNA present in mixtures and, by comparing it with a database, to determine the genus or even species from which the DNA originates. This works for products of vertebrates as well as for land living plants. An application would be testing of oregano for adulteration with foreign plants (olive leaves, sumac, etc). It can be also used for more complex matrices such as condiments, mixed tea and convenience food.

#### Nuclear magnetic resonance spectroscopy (NMR):

Initially used primarily for structure elucidation of pure chemical substances, this technique found its way into food analysis a few years ago. A large number of different substances are detected simultaneously, resulting in a comprehensive 'fingerprint' of the sample. By comparison with reference samples, deviations can be detected which can be used to detect adulteration or the

geographical or botanical origin. Honey-Profiling, which was mainly developed by QSI GmbH, Bremen, in cooperation with the equipment manufacturer Bruker GmbH, Rheinstetten, uses NMR technology and enables the detection of adulteration of honey with sugar syrups and also provides information on the geographical and botanical origin of honey.

NMR is also suitable for comparing different batches of the same product or for comparing a sample from the country of origin of a product with the delivered product at the destination.

#### 'Classic' mass spectrometry (GC-MS, LC-MS):

This technique is already established in the analysis of residues and contaminants, such as pesticides, antibiotics and pyrrolizidine alkaloids. Among other things, it is ideally suited for the detection of adulteration markers that have previously been identified using a non-targeted approach, such as HRMS, with high sensitivity at high sample throughput. Thus, there are various parameters that can be measured, eg, in olive oil, with this technique with targeted analysis. Presence or exceedance of a defined value indicates adulteration. For example, for cinnamon, the parameter coumarin provides an indication of the origin. Furthermore, markers for sugar syrup admixtures to honey, which are characteristic for eg, rice or beet sugar syrup, are also analysed.

This list is of course not complete. Depending on the product, other methods are used and many different other technologies are used.

#### Blockchain

The term 'blockchain' is also often used in connection with food fraud. First of all: this is NOT the ultimate solution to the problem of food fraud. A blockchain is a chain of several transactions and used as a digital register which records transactions between two parties.

The advantage of blockchain lies in its strong protection against manipulation. Every modification to the blockchain is traceable. However, a blockchain alone cannot guarantee the integrity of data it contains. This is still the responsibility of the person who must ensure that all data stored in the blockchain is correct and authentic. If this is the case, however, the data is safe from manipulation. Currently, an increasing number of food companies are starting blockchain projects. Walmart was a pioneer with a blockchain for mangos. In this pilot project, consumers were able to gain insight into the supply chain all the way to the producer by reading a QR code printed on the product label with their mobile phone. The possibilities here are (nearly) unlimited. Anyone who deals more intensively with blockchain technology will sooner or later come across the term 'smart contract'. Smart contracts automatically check if certain conditions are met that parties negotiated and agreed on before. They can be organised in a legally binding way. For example, upon delivery a product is automatically prepared for lab testing. Results are then automatically compared to contractually agreed specifications. Finally, the delivery is automatically released and payment for the delivery is automatically initiated. In the light of advancing automation and Internet of Things, it is recommended to keep an eye on this topic.

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# packaging & labelling



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## Follow the Red recycled road

*Nerida Kelton, MAIP, Executive Director – Australian Institute of Packaging (AIP);  
ANZ Board Member – World Packaging Organisation (WPO)*

When you think of outdoor furniture, roads, bollards, fences, patio decking and even footbridges you might not realise that a growing number of these items are made incorporating 'soft plastics' as a way to recycle flexible packaging and materials that have no home at this moment in the current kerbside recycling systems in Australia.

Of the nearly 1.1 million tonnes of plastic packaging placed onto the market in 2017–18, approximately 352,000 tonnes (33%) were soft plastics. However, only 29,000 tonnes or 8% of the soft plastic materials was recycled, with around 28,000 tonnes being recycled from Commercial & Industrial (C&I) sources and only 1000 tonnes from consumers.

This low recycling figure for soft plastic has highlighted the need for industry and government to give added focus to develop a strong national consumer collection program for soft plastics, combined with investment in additional reprocessing facilities and innovation to include recycled content in flexible materials. Changes to procurement strategies are key to stimulate further investment in soft plastic recycling and reprocessing, and to ensure that soft plastics are seen as a valuable resource that can be recycled, rather than disposed of as waste.

Currently, most Australian kerbside collection of recyclable packaging does not accept soft plastics. This restriction is required as the conventional materials recovery facility (MRF) does not allow for the handling of film and flexible plastics as they get caught in machinery and cause failures or damage.

This restriction has also meant that many consumers are simply not aware that Australia does have recycling and reprocessing facilities available for the recovery of post-consumer soft plastic packaging. In fact, Australia has a number of companies actively and passionately working hard to create new innovative solutions that will ultimately minimise the amount of soft plastics that head to landfill or end up in the oceans and the environment. Companies including RED Group, Replas, Close the Loop, Plastic Forests, Newtecpoly and others.

The REDcycle program is a true product stewardship model where manufacturers, retailers and households share the responsibility to create a sustainable future for as many soft plastics as possible. The cost of collecting and processing the material is covered by many of Australia's best-known brand owners and retailers. Together, Coles, Woolworths and brand owners enable the REDcycle national



program to make it easy for consumers to actively participate in the collection and recycling of household soft plastics in Australia.

In the simplest of terms, the REDcycle program accepts clean, dry, uncontaminated flexible packaging materials that meet the REDcycle material thresholds and have been approved through the Australasian Recycling Label (ARL) program. Packaging such as bread bags, pasta and rice bags, old shopping bags, biscuit and ice cream wrappers, confectionery and frozen food packaging, plastic bags, cereal box liners, fresh produce bags and Australia Post plastic satchels are all accepted via REDcycle.

The program is recognised through the Australian Packaging Covenant Organisation (APCO) and the Australasian Recycling Label (ARL) program and has established 'Return to Store', 'Store Drop Off' or REDcycle logos on-pack for the consumers. All brand owners must become a REDcycle partner to be able to use these symbols on-pack and are also required to join APCO. The 'Return to Store', 'Store Drop Off' or REDcycle logos on-pack communicate to consumers that they can return the packaging to collection points within major retailers across Australia.

Partners within the program have access to the Packaging Recyclability Evaluation Portal (PREP) to assess the recyclability of their packaging within Australian recovery systems. Packaging and artwork must also be approved through the ARL program and be able to meet the REDcycle recycling requirements to include the logo on-pack.

## Nestlé using blockchain to enhance coffee traceability

Nestlé has announced its plans to expand the use of the IBM Food Trust blockchain technology platform to its Zoégas coffee brand, enabling coffee lovers to trace their coffee back to its origins. The company has launched a 'Summer 2020' range of Zoégas whole beans and roast and ground coffee beans. The beans are a 100% Rainforest Alliance certified blend of arabica coffee beans from Brazil, Rwanda and Colombia.

Nestlé has partnered with the Rainforest Alliance to independently provide reliable data beyond what is usually disclosed by the company. The Rainforest Alliance provides its own certification information, thus enabling the traceability of the coffee. This information is accessible to everyone with the IBM Food Trust blockchain platform.

By scanning the QR code on the packaging, consumers can trace their coffee from the growing locations to the Zoégas factory in Helsingborg, Sweden, where the beans are roasted, grounded and packed. The data includes information about farmers, time of harvest, transaction certificate for the specific shipments and roasting period.

Nestlé began using blockchain in 2017, when it joined the IBM Food Trust as a founding member. Since then, the company has diversified the use of blockchain platforms to strengthen its transparency and sustainability efforts for consumers. Nestlé has given consumers access to blockchain with IBM on products such as Mousline purée and Guigoz infant formula in France. With OpenSC, Nestlé is also piloting open blockchain to monitor and communicate data related to the sustainability of milk and palm oil.

Nestlé continues to leverage technologies to improve the visibility of the whole value chain of its products, making supply chains more transparent.



### Paperboard ready-meals tray

The Confoil DP6060 Dualpak paperboard deep ready-meals tray is designed to provide manufacturers with a practical solution for preparing, displaying, storing and cooking ready meals.

Suitable for chilled, frozen or hot contents, Dualpak's paperboard is specifically designed for freezing and reheating and can safely be used in the microwave or oven.

When it comes to personalisation, the trays feature a fully printable surface, which can be used for customised branding.

The product also has sustainability features, providing a good alternative to single-use plastics. Simply add a clip-on lid for a simple take-home package, or select sealing film and a machine from Confoil's range to produce tamper-evident, leak-proof, heat-sealed meals.

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### Anti-static air knife

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The Gen4 Super Ion Air Knife incorporates EXAIR's Super Air Knife that reduces compressed air use by inducing surrounding airflow at a ratio of 40:1. The amplified airflow carries the ions to the target surface, eliminating static charges in less than half a second. Air volume and velocity can also

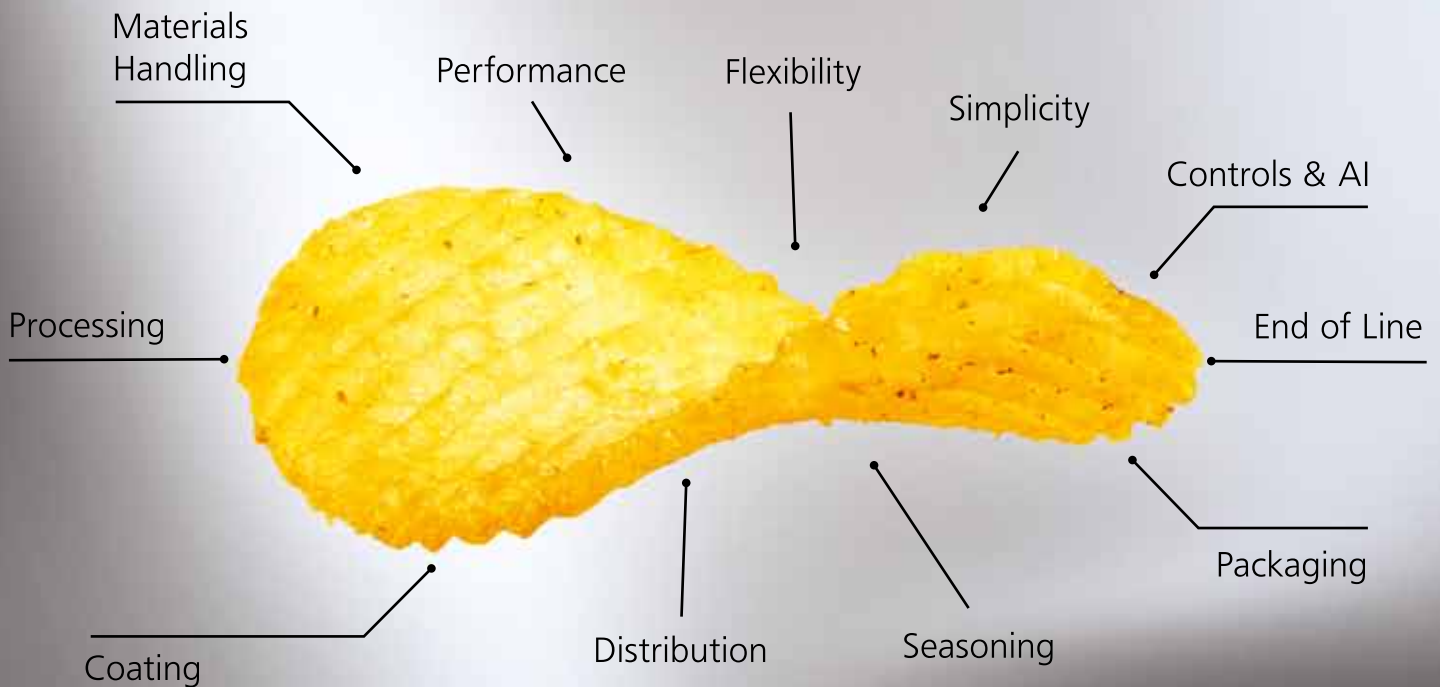
be controlled from a 'breeze' to a 'blast' to wipe or blow away debris. Available in lengths from 3" (76 mm) to 108" (2743 mm), the electrical ion source is shockless with no radioactive element. The Gen4 Super Ion Air Knives meet the safety, health and environmental standards of the USA, European Union and Canada that are required for the CE and UL marks, and are also RoHS compliant.

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# Food packaging that's good enough to eat

American Chemical Society

**T**hese days, many people are concerned about plastic waste; however, the convenience, mechanical properties and cost of plastic food packaging are hard to beat. But now, a growing number of innovators and entrepreneurs are trying to make edible packaging and tableware from foods like seaweed, milk proteins and potato starch, according to an article, *The Time Is Now for Edible Packaging*, in *Chemical & Engineering News* (C&EN), the weekly news magazine of the American Chemical Society, produced in collaboration with ACS Central Science.

Edible films, wrappers and straws have already found a specialty market and are starting to attract attention from larger food and beverage companies, according to freelance contributor Prachi Patel. At the 2019 London Marathon, the start-up company Notpla handed out sports drink pods, packaged in seaweed-based capsules, to thirsty runners. Although the packaging is safe to swallow, runners can choose to spit out the film. In that case, it biodegrades in only 4–6 weeks.

The article also revealed that an Indonesian start-up called Evoware has tested its edible seaweed-based packaging

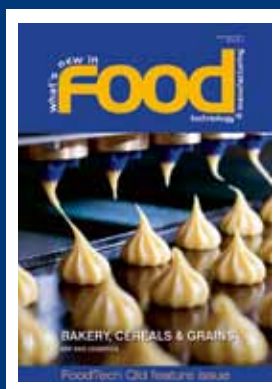
and is now selling it in small quantities for instant-noodle seasoning sachets and coffee pouches. At the US Department of Agriculture, chemical engineer Peggy Tomasula has made transparent films from the milk protein casein, which could be suitable for the dairy industry. The films are said to be 500 times as effective at blocking oxygen as traditional plastic wrap, according to the USDA.

Although edible packaging is gaining ground, challenges remain. Some worry about the hygiene of eating packaging that has been touched or exposed to germs during transport or while sitting on the shelf. Experts agree that edible packaging will require an outer layer, but these materials could also be made from compostable or sustainable materials, such as paper. Another obstacle is public acceptance: will people eat something that is usually thrown away? Consumers could perhaps be convinced if the packaging includes nutrients, such as vitamins or proteins, or just tastes good. And finally, improvements in heat and moisture stability need to be made before edible packaging can enjoy widespread use.

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## Foodmach launches Code One reliability package

At a time of uncertainty for manufacturers during the Covid-19 crisis, Foodmach has launched a package designed to increase certainty of both cash flow and equipment reliability for coding and labelling activities on packaging lines.

In partnership with Markem-Imaje, Foodmach's Code One package is designed to eliminate the hassle of making capital investments in product traceability solutions. The package includes all printing hardware, technical support services, spare parts and printing consumables for one fixed and low monthly charge over 60 months.

With a five-year warranty, the package is available on the complete range of Markem-Imaje coding and labelling technologies, including laser coders, carton and pallet labellers and inkjet printers. The package can also be expanded to include Markem-Imaje's traceability software solution, CoLOS.

"For too long, manufacturers have been the ones carrying the technical and financial risk for coding and labelling technology on production lines. Foodmach felt it was time this changed. We're confident in our technology and our ability to support our customers. So, for one fixed monthly charge, we'll take care of the equipment, technical support, parts and consumables," said Phil Biggs, General Manager, Product Traceability solutions at Foodmach.

"This isn't such a big leap in many ways, but it is for this technology sector. Our customers typically have similar arrangements in place for forklifts, photocopiers and work vehicles, so we thought it made sense to extend it to coding equipment," Biggs said.

Dr Rym Kachouri, General Manager, Service and Agency Products at Foodmach, added: "We have been trialling the package over the past 18 months with several large customers in the beverage, dairy and industrial sectors. That success has now resulted in the Code One reliability package now being made available more broadly. And at a time when many customers are restricting access to sites by visitors, Foodmach can offer various forms of remote support, along with top-up technical training to enable your team to be mostly self-sufficient. We can even conduct our normal new application assessment process remotely, so you may not even require a visit to site by one of our sales team."

For customers that can access the federal government's instant asset write-off incentive for purchases of up to \$150,000, Foodmach can structure a Code One package that does not include the equipment purchase in the monthly charge.



*The Code One all-inclusive reliability package from Foodmach is available on the complete Markem-Imaje product range, including the recently launched X45 and X65 TTO printer range.*

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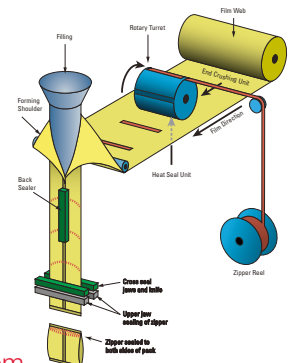
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# Recyclable PVC's role in food packaging

Recyclable PVC (vinyl) can provide benefits as a specialist packaging material; yet recovering this material for sustainable re-use presents challenges. Sophi MacMillan, Chief Executive of the Vinyl Council of Australia, provides some practical solutions.



For more than half a century, PVC or vinyl has been used on a global basis to meet specific functional food and beverage packaging needs. It suits many different food types, offering good clarity and physical properties, including heat tolerance, controllable gas and moisture vapour transmission capabilities and sealing performance.

Most vinyl is used in long-life products, particularly building products from pipes, cabling and flooring to window frames and wall profiles, all of which are recyclable. Vinyl used in packaging — such as bottles, thermoformed punnets, pharma blister packs and cling films — represents about 6% of the material's usage in Australia.

In these applications, vinyl plays an important role in protecting food from contamination and keeping it fresher for longer, while helping to reduce unnecessary food waste. It also protects a variety of high-value consumer products, from pharmaceuticals to toys, razors and batteries. In health care, vinyl is used in many critical medical items, such as intravenous fluid bags and oxygen hoses. Although a small volume polymer packaging material, it has specific, necessary uses with a relatively low environmental footprint compared to alternatives.

Without doubt, vinyl has revolutionised the way we live our modern lives, helping to deliver safer healthcare, protecting our food and delivering drinking water. Given the high

profile of plastics in the media, attention must focus on how we treat this recyclable material at end-of-life and recover it for beneficial re-use, including energy.

Post-consumer rigid PVC packaging is collected by most local councils around Australia. With existing infra-red sorting technologies, it can be sorted into a defined stream, reprocessed and used as recyclate for use in new products manufactured in Australia. However, at just over 5% of all plastic packaging materials (industrial and consumer) used in Australia, vinyl packaging is only a small proportion of total household packaging waste and is often considered uneconomically viable to sort and recycle.

The 2017–18 recycling rate of PVC packaging waste in Australia is reported to be 7.2% — which is low when compared to the overall average rate of 20.6% for all plastic packaging. (Source: 2017–18 Australian Plastics Recycling Survey published by Envisage Works, 30 January 2019). Nevertheless, clean, separated vinyl waste has value and collection has been actively encouraged by industry.

Clean, separated vinyl waste is relatively easy to recycle, requiring less energy for reprocessing than all other polymers. Using recycled vinyl in new products replaces virgin material and reduces carbon emissions associated with manufacturing virgin vinyl by about 80 to 85%, significantly lowering the carbon footprint of new vinyl products.





*Given the high profile of plastics in the media, attention must focus on how we treat this recyclable material at end-of-life and recover it for beneficial re-use, including energy.*



While technology exists to identify and sort PVC, few materials recovery facilities (MRFs) are currently operating these systems because of 'low volumes'. Yet substitution of a small handful of PVC packaging items would almost certainly lead to higher environmental impacts and higher waste volumes in terms of food waste, product damage or alternative non-recyclable composite packaging materials. It will also not remove PVC entirely from the waste stream, so an effective solution to remove PVC 'contamination' would be required regardless.

In my view, we need to consider whether the system of use is 'open' or 'closed' and how these waste plastics can be collected and recovered effectively in both systems for processing into new products, giving it a value as a raw material.

Examples of a 'closed' approach might be a major event, an airline or a hospital, where all the plastic waste can feasibly be collected, sorted, segregated and ultimately recycled as single, clean polymer waste streams.

An excellent example of PVC packaging being collected and recycled is that of IV bags in health care. Schemes in Australia (our PVC Recycling in Hospitals Program), South Africa, Thailand and the UK successfully demonstrate that this material can be separated at waste source, collected and recycled into useful new products.

Conversely, in an 'open' system, such as take-away restaurants, all 'control' of these waste plastics is lost once single-use plastic walks out the door.

As a material that meets so many of our modern-day needs effectively, we should give careful consideration to how we treat and re-use PVC at end-of-life.

### Solution options

- Separating PVC at source in 'closed' consumption systems to achieve a clean waste stream, such as the hospital PVC recycling program. This requires committed collaboration by brand owners, users and the PVC packaging industry to explore the feasibility of establishing collection and recycling schemes, and, ultimately, end markets.
- Using existing or new techniques and technologies to better separate PVC from co-mingled waste streams at a greater number of Secondary Sorting Facilities around the country, after the removal of higher volume PET and HDPE.

- Researching, assessing and supporting the commercialisation and adoption of new technologies — such as chemical separation — to improve production of clean, single material streams for reprocessing.
- Developing Waste-to-Energy projects for co-mingled residues.

Demand is growing from manufacturers to increase the use of vinyl recyclate, and signatory companies of our PVC Stewardship Program are publicly committed to using recyclate in new products where standards permit.

Through greater collaboration between industry, manufacturers and the wider waste and recycling sector, the vinyl industry can be part of the solution and transform our plastic waste into a sustainable future resource.

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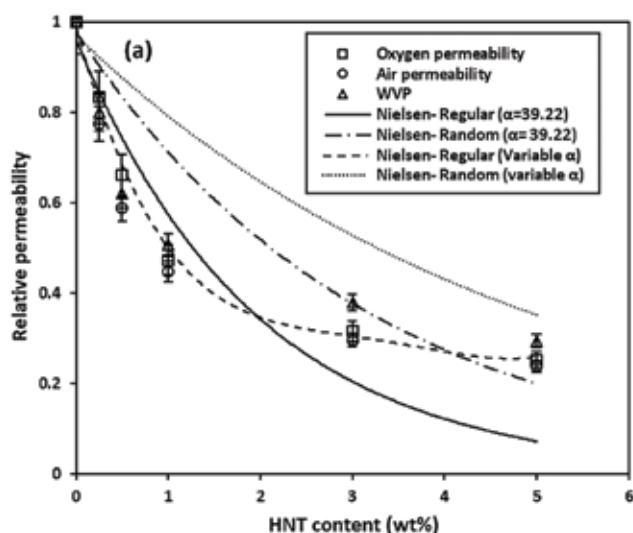
# Improving the shelf life of avocados



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**P**lastic can be an important component of food packaging as it can create a barrier against nasties such as bacteria, as well as water and gas. This can help to prolong the shelf life of many foods and prevent waste.

However, given the finite resources of petroleum-based polymers, which are used to make conventional plastic food packaging, as well as the huge scale of plastic waste exceeding 150 million tonnes annually worldwide, it is important that alternative and eco-friendly materials are developed.



Now Curtin University researchers have developed eco-friendly films that, when used in food packaging, can prolong the shelf life of fruits such as avocados and peaches, offering potential benefits to fresh produce growers and retailers as well as the environment.

The research, published in *Composites Part B: Engineering*, found polyvinyl alcohol (PVA) bionanocomposite films were biodegradable and served as a significantly more efficient barrier against water vapour, air and oxygen — all of which reduce the shelf life of foodstuffs and the rate of fungi growth.

Lead author PhD student Mrs Zainab Waheed Abdullah, from the School of Civil and Mechanical Engineering at Curtin University, said the research team had developed novel bionanocomposite films that served as a significantly more effective barrier to conditions which contribute to the fruit “going old” more quickly.

“Using biopolymers, which occur in nature or are produced from natural resources like plants and animals, we manufactured bionanocomposite films as sustainable packaging material which we tested on peaches and freshly cut avocados,” Abdullah said.

“The ability of water vapour, air and oxygen to permeate bionanocomposite films reduced drastically and it clearly demonstrated the improvements of the films’ barrier properties. These bionanocomposite films were also able to better withstand variations of temperatures and humidity levels.

“Fruit weight loss and colour change were recorded daily to reflect product shelf life, revealing significantly decreased weight loss rates of 25.24% and 18.05% for avocados and peaches packaged by bionanocomposite films respectively, as opposed to 40.86% and 27.35% based on corresponding unpacked control fruits. This offers tremendous potential benefits to the food industry and in turn consumers.

The research was supervised by Dr Yu Dong from Curtin’s School of Civil and Mechanical Engineering and was in collaboration with Professor Shaomin Liu from Curtin’s WA School of Mines: Minerals, Energy and Chemical Engineering.

The research paper is titled ‘Water and gas barrier properties of polyvinyl alcohol (PVA)/starch (ST)/ glycerol (GL)/halloysite nanotube (HNT) bionanocomposite films: Experimental characterisation and modelling approach’.





## Plant-based ingredients portfolio

DuPont Nutrition & Biosciences has developed a plant-based solutions portfolio to help food producers meet demand for foods and beverages that are meat- and dairy-free.

The range includes plant proteins, cultures, probiotics, enzymes and stabilising solutions that provide nutritional and functional benefits. The plant-based solutions allow manufacturers to redefine existing products or create new categories that give consumers a wider range of choices. The plant-based solutions portfolio aligns with the DuPont platforms for digestive health and clean label solutions.

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## Weight loss ingredient

OptiBiotix Health Plc's SlimBiome is a patented, functional weight loss ingredient that contains non-digestible prebiotics and dietary fibres.

It's designed to create a feeling of fullness, prevent overeating by maintaining blood sugar levels and help burn calories by promoting a healthy metabolism, according to OptiBiotix.

The ingredient is heat stable, has no distinguishable taste and can be added to snack bars, meal replacement shakes and dairy and bakery products during manufacture.

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# Detecting bitter almonds in your nougat

Small percentages of bitter almonds can cause issues for producers of food products, such as nougat and ice-cream, that include almonds. Now a research group at the Alicante University (UA) in Spain has developed a new technology that can quickly identify whether an almond is sweet or bitter using non-destructive digital image processing.

In terms of world almond production, California holds 80% of the market share, followed by Australia, with 8%, and Spain, with 5%. The presence of a small percentage of bitter almonds in batches of sweet almonds leads to toxicity and economic repercussions for producers of almonds and derived products, such as nougat, drinks and vegetable pâtés or flours.

A bitter almond detection procedure has been developed by professors Juan Mora, Luis Gras, Guillermo Grindlay and Marta Navas, all of them from the Department of Analytical Chemistry, Nutrition and Food Science at the UA. The technology allows a quick classification of almonds based exclusively on the pro-

cessing of different parameters of digital images, which can then differentiate bitter almonds from sweets almonds.

The almond tree has a great genetic variability. Although sweet taste is dominant in almonds, there is still a large presence of bitter almonds in Spanish crops. According to Juan Mora, this presence in manufactured products (nougats, chocolates, etc) is a serious handicap for the producing companies, which have lacked a quick and simple tool so far. However, in addition to the unpleasant taste, the greatest risk lies in the toxicity of these fruits. The bitter taste of almonds is due to the presence of amygdalin, which, upon contact with the enzyme amylase in saliva, is transformed into benzaldehyde (which confers the bitter taste) and hydrocyanic acid or cyanide, a highly toxic compound.

The simple method developed by the UA researcher consists of placing the almonds on an illuminated surface. There, the almonds can be dosed by the device automatically or manually, individually or in batches, by means of a hopper or conveyor belt adapted to the line that supplies the almonds. Once the sample batch has been distributed evenly on the surface by means of conveyor belts or vibrating tables, it is illuminated with an ultraviolet light source. This means that the bitterest almonds can be detected quickly. A simultaneous processing of the digital images retrieved together with a computer application that includes a discrimination model makes the detection of almonds with higher concentration of amygdalin possible.

The director of the research group points out that this is a non-destructive analytical method based on fluorescence and artificial vision to identify bitter almonds. Thus, the basis of the method lies in the fluorescence emitted by the compounds naturally present in bitter almonds. These can be detected specifically only by illuminating the sample with appropriate wavelength light and subsequent processing of the image generated. The method allows researchers to automate the classification of sweet and bitter almonds quickly, simply, objectively and in real time using an inexpensive, eco-friendly and non-destructive procedure.

The method doesn't require the use of chemical reagents and doesn't generate any type of waste, and the researchers said the method can be used safely by any operator without prior specific training. Additionally, the system allows for automated and online industrial deployment.

*The procedure and device has been patented under the name "Procedimiento para la detección de almendras amargas basado en el procesamiento de imágenes digitales y el dispositivo asociado" (Procedure for the detection of bitter almonds based on digital image processing and the associated device) with patent number P201930561.*



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## Researchers reveal the secret to creamy melted chocolate

**T**he smooth versus grainy texture of a piece of chocolate can be due to the amount of open space within the chocolate at the microscopic level, which could change how it melts on the tongue. Smooth creamy chocolate is achieved through a process called tempering, where the chocolate mixture is repeatedly heated and cooled. Improper tempering can result in a grainy mouthfeel, with the particles appearing different on examination. For food manufacturers tempering vast quantities of chocolate, it is vital to understand how that process can affect the taste of chocolate.

Scientists from the University of Guelph at the Advanced Photon Source (APS) located at the U.S. Department of Energy's (DOE) Argonne National Laboratory have used an X-ray machine to discover the properties of chocolate's microstructure that provide a pleasing mouthfeel.

Researcher Fernanda Peyronel used a technique called ultra-small-angle X-ray scattering (USAXS) to investigate a property called fractal dimension, a feature of the geometric configuration of tiny particles of chocolate. Researchers were trying to determine whether these particles have a more open or closed structure, correlating that to the mouthfeel experienced by consumers.

The USAXS instrument provides a unique view into the characteristics of chocolate and other materials, as X-ray scattering allows researchers to study a larger volume of material simultaneously, instead of relying on detailed information about a few particles. The X-ray scattering process provides a statistically averaged picture of a much larger region.

"When you're talking about a chocolate manufacturer that is tempering tons and tons of chocolate, knowing how that process is affecting how the chocolate tastes is very important," Peyronel said.

Developing a better understanding of the tempering process could lead to major energy and cost savings, as the process requires a considerable amount of time and energy. Previous food science research using the USAXS technique focused on other edible fats, such as cocoa butter. By analysing chocolate as a multi-ingredient matrix containing cocoa butter, cocoa powder, sugar and an emulsifier such as lecithin, researchers hope to develop a greater insight into the relationship between chocolate microstructure and mouthfeel.

"Some chocolate makers want to replace some of the cocoa butter, because this edible fat is quite expensive. However, it's unclear how the cocoa butter affects the microstructure," Peyronel said.

While the atomic and molecular structures of chocolate are well known, they are not what consumers experience in their mouths. Instead, a key indicator that has been used to characterise a good chocolate is called a polymorph. The best polymorph, according to researchers, is called V (beta-5), with a configuration in which the atoms are at their energetic minima.

Researchers are now trying to create a V polymorph in chocolate that is stable, lending pleasant mouthfeel.

The research was funded by the Natural Sciences and Engineering Research Council of Canada.



## Cherry flavour research

In 2013, the German Stiftung Warentest foundation found harmful benzene (a carcinogen) in drinks with cherry flavour; it is theorised that the benzene got into the drinks via benzaldehyde, an essential component of cherry flavouring. A study by the Leibniz-Institute for Food Systems Biology and the Technical University of Munich (TUM) has further analysed the presence of benzene in cherry-flavoured drinks.

When examining soft drinks in 2013, Stiftung Warentest came across small quantities of benzene, with one drink containing just under 4.6 micrograms of benzene per litre. For comparison, in Germany, one litre of drinking water is allowed to contain only one microgram of benzene. At the time, experts at Stiftung Warentest hypothesised that benzaldehyde was the cause of the benzene contaminants observed.

“As our research is specialised on odorants, we followed up on this supposition in the interest of consumer protection and at the suggestion of the German Association of the Flavour Industry,” said Stephanie Frank, lead author from the Leibniz-Institute for Food Systems Biology at the Technical University of Munich.

To do this, scientists first established a reliable, highly sensitive quantitation method of benzene. Then, they carried out experiments with various model solutions which contained benzene-free benzaldehyde. Researchers also examined cherry juice produced under laboratory conditions, to which they also added the pure odorant.

“Our findings confirm the assumption of the Stiftung Warentest and also explain how the formation of benzene occurs — an important requirement in solving the problem in the long term,” Frank said.

The study revealed that the longer the odorant is exposed to light, the more benzaldehyde is converted into benzene. But the light intensity is also decisive. In contrast, the pH value, the oxygen content, the presence of metal ions or the temperature did not affect the benzene production in the model solutions. No benzene was formed in the cherry juice produced under laboratory conditions during light exposure, with researchers reasoning that it is possible that the dark red colour of the drink acts as a light protection filter, preventing the formation of benzene. The benzene found in soft drinks is probably the result of added cherry flavouring which has already been contaminated with benzene.

“This is why we must be sure to protect flavourings containing benzaldehyde from light, from when the substance is produced to when the product is sold, for example, by storing them in amber glass vials,” said Peter Schieberle, Professor for Food Chemistry at the Technical University of Munich.



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## Natural extract flavouring system for dairy products

In response to the demand for healthier and indulgent products, Sensient Technologies has created a collection of rich dairy flavours. In addition to the great taste, the flavours are designed to enhance the mouthfeel of products and provide an indulgence factor for the consumer.

The DairyBoost range of natural extract flavouring systems deliver the rich mouthfeel and authentic characteristics associated with full-fat dairy products. The cost-effective natural flavourings are designed to provide food technologists with the flexibility to create healthier products without compromising on taste.

The DairyBoost Plus range of natural butter, milk and cream flavours is designed to elevate the mouthfeel to enrich the flavour of a range of dairy products. It is made using the fresh milk from New Zealand, forming the basis of a range of high-impact dairy flavours. The range was developed to meet consumer expectations and create a healthy and indulgent flavour experience. It is locally manufactured in Australasia, can be labelled as natural flavour and can cater for natural, halal, liquid and powder requirements.

For more information and samples, contact Sensient Australia at [salesaus@sensient.com](mailto:salesaus@sensient.com) or Sensient New Zealand at [salesnz@sensient.com](mailto:salesnz@sensient.com).

**Sensient Technologies**  
[www.sensient.com](http://www.sensient.com)



## On-site chemical analysis of Kombucha

Perform in-house quality analysis with real-time results using the CDR KombuchaLab. Quality parameters can be monitored with confidence at every step of the production process, from fermentation through to bottling. This versatile and compact system responds to the needs of brewers of all sizes.

The device provides a complete system, equipped with everything users need to carry out the analytical tests. The easy-to-use methods coupled with ready-to-use reagents enable tests to be carried out by personnel with minimal training anywhere on the production floor. Real-time results empower brewers to make immediate production decisions to achieve the desired sensory characteristics.

In as little as 10 minutes an entire analytical panel can be performed on samples. This is possible due to the featured Multitasking mode which allows different analytical parameters to be run simultaneously. Alternatively, up to 16 different samples can be tested for the same parameter at the same time.

Tests currently available include alcohol by volume, acetic acid, fermentable sugars, gluconic acid, total lactic acid, YAN and total polyphenols.

**Australasian Medical & Scientific Ltd**  
[www.amsl.com.au](http://www.amsl.com.au)

## Specialty flour



Grainstone Brewers Premium Flour is a nutritious specialty flour made from upcycled brewers' spent grain, a co-product from the manufacture of Australian beers. High in protein, dietary fibre, calcium and B vitamins while low in gluten, the flour is suitable for a number of products such as artisan breads, biscuits, snack foods, breakfast cereals, sausages, pies and more.

The sustainably sourced flour is available for food manufacturers and commercial flour buyers, as well as scientists and academics for research and product development trials.

Grainstone received the Jury's Choice 'Innovative Health Through Diet' award at the 2019 Global Table Food Innovation Summit, and also received innovation funding from the Fight Food Waste CRC for research work being conducted with the Queensland University of Technology.

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## Fresh or freeze-dried raspberries with your muesli?

When freeze drying, the objects containing water are frozen and placed in a vacuum chamber. Under low pressure heat is added, which sublimates the frozen water (ie, it transitions from a solid to a gaseous state). The dehydrated, unchanged structure of the material remains and this is why freeze-dried fruits such as raspberries in muesli look and taste fresh. Now a team of scientists has examined the freeze-drying process in detail and their findings could lead to a more efficient process in the future.

With the help of neutron beams from the Heinz-Maier-Leibnitz (FRM II) research neutron source, scientists at the Technical University of Munich (TUM) and the Otto von Guericke University observed the direct transition from ice to water vapour during the freeze drying of particles in an experiment. The team has thus gained a method of testing theoretical models in practice.

While prior research has provided theoretical models about the freeze-drying process, “no-one has experimentally investigated the pattern according to which the ice in particles actually sublimates”, said Sebastian Gruber, lead author of the study and doctoral candidate in food technology at TUM. Researchers are particularly interested in the sublimation front (the area in which the ice vaporises) and have used a neutron radiography instrument (ANTARES) to provide the prerequisites for the experiment, because neutrons make water visible.

“ANTARES is also particularly well suited to investigate samples under low pressure and low temperatures,” said Dr Michael Schulz, instrument scientist at TUM.

Using neutron radiography, tomography and the resulting 2D and 3D images, the scientists revealed that the ice sublimates from the particles of their sugar sample in a radial manner, and in a planar from the ground towards the centre of the bed.

“Our aim is to further advance the research on the freeze-drying process in order to create better process conditions in the future. Because if the particle size, pressure or temperature cannot be coordinated in an ideal manner during sublimation, this can lead to a structural collapse and thus a loss in quality or efficacy,” Gruber said.

The food industry is currently trying to counteract these undesired phenomena with longer drying processes. The behaviour of the sublimations front, which has been experimentally confirmed for now, could contribute to reducing the time taken and thus save energy. The research findings have been published in *Chemical Engineering Science*.

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