Snackification

Munching
Crunching
Chewing
Breakfast cereals are popular around the globe. Americans devour an exceptionally large amount, totaling 2.7 billion boxes each year – that's 14 pounds per person.

More compactly, cereals are sold in bar form. The global cereal bar market is set to reach 14 billion US dollars by 2020, as projected by market research company Technavio.

Manufacturers emphasize the high protein and fiber content in cereal bars. They are considered healthier than most other on-the-go breakfasts, especially in countries such as Denmark and Germany.
Dear readers,

What do increasing urbanization, growing mobility needs, constantly growing productivity pressure, and a desire for greater flexibility have in common? All these factors have brought about a major shift in eating habits around the globe. Set meal times are increasingly being abandoned in favor of snacks that can be consumed flexibly and on the go, at any time of day.

With this development comes a huge rise in demand for high-quality processed snacks – and tremendous opportunities for food manufacturers. At GEA, we aim to help manufacturers capitalize on these opportunities with our innovative production and process technology.

Our value-adding solutions are based on close observation of global challenges, megatrends and influential region-specific developments. We are harnessing our engineering expertise to meet the challenges of today and the future, in a number of different areas including food, beverages, dairy, as well as chemicals and pharma.

In this issue of GENERATE, we invite you to discover the various solutions we offer food manufacturers to help them keep pace with constantly changing demands. Learn more about how the world’s most sought-after pizza cheese is made, about drinks containing nutritious solid ingredients, and the unprecedented production of crispy golden chicken nuggets in Kenya.

I hope you enjoy your read!

Best wishes,

Jürg Oleas
CEO

JÜRGEN OLEAS
Chief Executive Officer
GEA Group Aktiengesellschaft
Finding new recipes for success
Substitutes for salt, sugar, and wheat are in demand

Always on the move
Alvaro Martínez, Regional Head of Western Europe, the Middle East and Africa

Why snacking is on everyone’s lips
A new global trend

Bites in bottles
Everything about drinks with fruit and cereals
Content #17

Editorial 3
Why snacking is on everyone’s lips 6
A cheese for all 14
Finding new recipes for success 16
Meat processing pioneers in Kenya 20
Saving precious water 22
Olive oil: an elixir of life 24
Fighting food loss with technology 26
Bites in bottles 28
Question & Answer: Robert Spurway 32
Always on the move 36
Art in engineering 40
The healthy side of snacking 42
About this publication 43

A cheese for all
No pizza without mozzarella
Why snacking is on everyone’s lips

Snacking is big. Sweet, savory, creamy or crunchy – more and more consumers would rather snack than sit down for a meal. The increasing trend toward healthy convenience foods is a huge opportunity for manufacturers of nutritious snacks that also taste good.
From peanuts to popcorn, pretzels to cheese puffs, and from biltong to fat-bottomed ants, tamagogani or Witchetty grubs – the whole world loves to snack. More and more people are munching and crunching their way through the day, chewing on Snickers, gorging down Twinkies and Little Debbies donuts, devouring Chipwiches, alfajores, brigadeiros, halva, Haribo, and many other tasty treats.

As the Hartman Group highlighted in their 2013 Modern Eating Report, snacks are typically viewed as small meals that can be enjoyed in between regular mealtimes, and that involve little to no preparation or clean-up.

A snack can be sweet, savory, creamy or crunchy. In the West, we have been snacking for around 100 years now – but it’s probably safe to assume that eating smaller meals at certain times during the day, either in between or instead of larger meals, is as old as mankind itself. Cavemen almost definitely ate what they caught on the spot, before someone else could take it.

**SMALL TREATS MEAN BIG BUSINESS**

So, snacking is nothing new. But what is new is the size of the market, which has now reached a level unprecedented since its explosion in the 1980s: from 2013 to 2014, global consumers spent 374 billion US dollars on snacking, according to Nielsen’s global “Snack Attack” report (2014). That is an average year-on-year increase of two percent. But in the Asia-Pacific and Middle East/Africa, annual snack sales grew two times faster, while in Latin America sales increased by nine percent. Savory snacks alone, including wheat crackers, rice cakes, and pita chips, rose by 21 percent.

Snacking has become a global trend that mirrors the diverse eating patterns of today’s fast-paced society – and not only in high-income countries. In emerging markets, the middle class is rapidly growing and evolving into an affluent consumer group. With improving education levels and a higher participation of females in the workforce, family life has changed – and,
increasingly, regular family meals are becoming the exception rather than the rule. Whereas most baby boomers were raised to believe that eating in-between meals wasn’t good for you, and to view a snack as a treat, millennials have different attitudes and eating habits. As this younger generation continues to grow in economic influence, the snacking landscape continues to change.

THE "SNACKIFICATION" OF EVERYTHING
Individuals’ energy needs vary widely. The World Health Organization states that energy intake should be in line with energy expenditure. But how often should we eat? As a rule, dietitians recommend three square meals to five smaller meals throughout the day. And yes, not so long ago, that is what we had. But it hasn’t always been like that, as food historians like to remind us. The Romans, for example, used to eat just once a day – and it took a long time for our eating behaviors to change. As Swiss manufacturer of flavors and fragrances Givaudan points out, snacking is embedded in Asian culture much more than it is in Western culture – with snacks ranging from nuts and seeds to dumplings and noodles and, increasingly, processed products such as rice crackers, cassava, or seaweed chips.

**THE SNACK MARKET WORLDWIDE**

**NORTH AMERICA**
- $124bn

**LATIN AMERICA**
- $30bn

**EUROPE**
- $167bn

**MIDDLE EAST & AFRICA**
- $7bn

**ASIA-PACIFIC**
- $46bn

SOURCE
The Hartman Group estimates that snack consumption now represents around 50 percent of all food and beverage consumption. Not only do we snack in-between meals more than ever before, but the line between a meal and a meal replacement or snack is becoming blurred.

Starting with breakfast, almost any type of food can be turned into a ready-to-eat snack item. Cooked breakfasts are quickly falling off the menu in our fast-paced society, with breakfast cookies, liquid breakfasts, or lattes to go replacing filter coffee, toast, ham and eggs, or porridge. Baked products like pre-made sandwiches, cookies, and cakes are always available to be grabbed and gobbled on the fly. And what about the good old lunch box, or the more elaborate bento box?

Is it a meal or a meal replacement? The truth is, it doesn’t really matter. The trend is definitely for people to snack multiple times a day, and often forego meals altogether. From chicken nuggets to pancakes bites, in the USA, “snackification” has even been identified in restaurants, with meals being served in increasingly very small portions. Snack-lovers indicate that they place great importance on portion control – so it may come as no surprise that women consume more snacks than men.

TASTY AND NUTRITIOUS – THE BEST OF BOTH WORLDS

One in four consumers snack to satisfy hunger pangs or cravings in between meals, found Nielsen, whereas 63 percent snack for nutritional reasons. There is therefore a growing trend toward healthy convenience foods – nutritious snacks that also taste good.

High-protein snacks such as nuts, granola bars, and lean meat are the highest performers, as well as products containing probiotics, functional fibers, and super fruits with exotic names like aronia, buffaloberry, pichuberry, gac and lucuma – all of which claim to provide endless health benefits. Both fresh and dried fruit and vegetables are replacing snacks with higher fat and sugar content: Nielsen found that 18 percent of global consumers said fresh fruit is the one snack they would choose from a list of 47 different snacking options, although preferences vary widely. However, 57 percent of respondents in the Asia-Pacific said they snacked on vegetables.
LESS IS MORE

In line with consumers’ desires for clean labels and the general free-from trend, consumers want snacks to stick to the basics. Although very few consumers have wheat, gluten, or dairy intolerances, there is a public perception that foods free from these ingredients may be healthier. But even more so, there are clear preferences for products that forego preservatives, stabilizers, artificial flavors, and genetically modified organisms.

Environmentally conscious consumers are also focusing more on ingredients – they want their snacks to be organic and sourced sustainably and locally. All-natural ingredients are important to 45 percent of consumers worldwide, as Nielsen found.

Consumer approaches to eating and drinking have become much more flexible. It is also remarkable that time-strapped consumers are not only snacking because of their busy lifestyles, but also with a view to healthy, mindful eating.

MASSIVE OPPORTUNITY FOR SNACK MANUFACTURERS

For the most part, pre-fabricated and portion-wise packaged snacks are extremely sophisticated products. The more complex the processing of foodstuffs, and the more energy it requires, the more important the efficiency of the technology behind it.

Together, food designers, food engineers, and manufacturers have created a huge variety of snacks across a wide range of categories, from confectionery to savory snacks, to cookies and cakes, vegetables and fruits, and refrigerated products. Innovative processing, packaging, and vending technologies, as well as novel marketing principles and business models, are enabling them to create and respond to new snacking trends more effectively.

As Nielsen says, there is a massive untapped opportunity to gain a greater market share in the nutritious, portable, and easy-to-eat meal alternative market of snacks. However, it is key to be aware of both global trends and regional and local snacking preferences. Because snacking preferences around the world vary just as much as local cultures. Nielsen found that in North America savory snacks are most popular, contributing more than one-fifth of total snack sales (27.7 billion US dollars). The third-most popular snack here is confectionery, whereas this category makes the biggest sales contribution to the overall snack market in Europe (46.5 billion US dollars). That includes sugary sweets such as chocolate and hard candy, as well as gum. In Germany alone, the average adult consumes 32.5 kilograms of candy every year, including licorice – and this number is even higher for chocolates, cookies, and cakes (Association of the German Confectionery Industry). In the Middle East and Africa, confectionery is the biggest category in the snacks market – but at 1.9 billion US dollars, it can scarcely be compared to sales in Europe. Refrigerated snacks make up the biggest category in the Asia-Pacific (including yogurt, cheese snacks, and pudding), contributing almost one-third of all snacks sold (13.7 billion US dollars). Based on its increased consumption per capita and growing population, the Asia-Pacific market is expected to see the biggest growth, according to Nielsen.

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TASTY SNACKS WITH GEA TECHNOLOGY

IMAFORNI ROTARY MOLDER
Technology is behind the dough for Mondelez belVita breakfast biscuits. For this soft-dough and cookie product family, manufacturing is based on three main processes: wire-cutting, depositing and rotary molding. The IMAFORNI rotary molder is designed for the production of shortbread dough. High performance in terms of dough quality, number of pieces formed, running speeds, and consistency of production is crucial for bakers. The rotary molder’s control system can be fully servo-motorized, and the servomotors are operated via a screen. The molded dough is then transported to an oven – and out come crunchy biscuits with the nutrients and energy that hungry consumers need.

GEA SMARTPACKERS
Noberasco, a leading Italian producer of dried fruits packaged without preservatives, receives raw materials such as apricots, plums, figs, dates, grapes, and tomatoes from all over the world. The manufacturer then processes and packages fruits using an innovative pasteurization system that makes fruit consumption possible long after harvest, without affecting its nutritional content and health benefits. To keep the dried fruits soft and tasty, the quality of the plastic bag, integrity of the seal and speed of packaging are crucial. That’s why Noberasco runs GEA SmartPackers that package soft fruit in Quatroseal bags at a speed of 65 packs per minute (ppm). The GEA line packages pillow bags at 125 to 130 ppm for the 125 gram packs and 110 ppm for 250 gram packs.

GEA MAXIFORMER
The bell, the ball, the bow-tie and the boot – these are the four shapes that the world’s best-known chicken snack comes in. GEA’s new MaxiFormer rotary drum former delivers products with excellent shape retention and weight accuracy and is designed for high-volume production of homemade-style chicken nuggets. It is suitable for continuous operation in 24-hour shifts with up to 40-hour runs. With the MaxiFormer, GEA supplies a complete 1,000 mm wide line solution comprising defrosting, grinding, mixing, forming, coating, frying, cooking, freezing, and packing. For manufacturers who want to reduce the fat in deep-fried food, GEA CookStar uses a high-velocity airflow to create crispy crusts, resulting in leaner, healthier products.
A cheese for all

With the world’s appetite for pizza steadily growing, the demand for pizza cheese – especially mozzarella – is on the rise. State-of-the-art technologies ensure the highest quality in the processing of these stretched curd cheeses.
Crispy pizza crust, spicy tomato sauce, and delicately melting mozzarella: the savory Italian flatbread that is pizza dates back to 18th century Naples, and has become an international food phenomenon. Along with Italian immigrants, pizza made its way from the foot of Mount Vesuvius to the United States of America, where it quickly became popular. The birth of the country’s first pizza chain in 1958, Pizza Hut, gave it even more widespread appeal. By the early 1970s there were more than 1,000 Pizza Huts in the US, with further locations in Canada, England, and Japan. Today, the away-from-home pizza market in the US brings in 46 billion US dollars in sales every year – accounting for 9.5 percent of the country’s commercial food-service market. The American population eats the equivalent of 100 acres of pizza every day. And on a global scale, their hunger for pizza accounts for one-third of the international market.

THE PERFECT PIZZA CHEESE
86 percent of pizza lovers would rather choose their own toppings than order a standard pizza type, as PMQ Pizza Magazine’s study highlights. But there is little debate about which is the perfect pizza cheese: it's mozzarella. It becomes elastic when heated, and when pulled it forms long strings – the key characteristic of a genuine pizza cheese. Global mozzarella consumption grew from 2.78 million tons in 2010 to around 3.2 million tons in 2015. By 2021, the market for the cheese is expected to grow to up to 3.6 million tons. The US will account for the biggest slice of this, closely followed by Latin America and Western Europe.

PASTA FILATA
Mozzarella is the best known type of Italy’s typically mild, and often buttery, formaggi a pasta filata. These stretched curd cheeses undergo an elaborate procedure that lends them their characteristic stringy, stretchy quality – the filatura. The curd is gently stretched and kneaded while adding hot water or steam. The water becomes partially absorbed and the excess of water is removed. Thanks to the plasticity of the casein, the curd becomes soft, elastic, and stringy, which is what pasta filata is so famous for. The mass of pasta filata is then shaped into individual spherical or cylindrical portions that, after cooling, are ready for consumption, with no ripening required. Fresh mozzarella is a very soft cheese with a high moisture content (58–65 percent). It is made from whole, pasteurized cow or buffalo milk. To give it a shelf life of around 30 days, it is usually packed in a preserving liquid. Mass-produced pizza cheeses, in contrast, have a lower moisture content than mozzarella (48–52 percent) and are made from either whole or skimmed milk. Packed for commercial use, their typical shelf life is up to four months.

PIZZA CONQUERS THE EAST
While nine in 10 Americans eat pizza at least once a month, the Chinese are only just gaining an appetite for this foodie delight. With 6,500 pizza restaurants, China is about 20 years behind the US in terms of pizza stores per capita. There are around 70,000 pizza restaurants in the US, making up 17 percent of all restaurants. But thanks to the growing westernization of Chinese lifestyle, hunger for pizza is growing – and so is the demand for its most famous topping. Sales in the Chinese cheese market topped 530 million US dollars in 2014 (up 24 percent), and by 2017 turnover is expected to surpass 810 million US dollars. The rise of chains like Pizza Hut in China opens up major business opportunities for those importing mozzarella. However, the Italians remain unimpressed by this international success and the assimilation of pizza. The way they see it, there are two types of their famous flat bread: Italian pizza, and the one available in the rest of the world.

VULCAN: THE UNIQUE ANTI-STICK TECHNOLOGY
The most important part in the pasta filata production process is, of course, the filatura: heated to 62–65 °Celsius, the sour curds are mixed, kneaded, and stretched – and finally molded into different shapes for various applications. To prevent the curds from sticking to the augers that feed them through the stretching and moulding machines, GEA recently developed a unique anti-stick treatment for the metal surfaces that come into contact with the product. The Vulcan treatment consists of multiple mechanical polishing steps which create a smooth surface that curds can’t stick to. It replaces traditional Teflon coatings, simplifies cleaning, reduces waste, increases product line efficiency, and is extremely durable.

SOURCES
CHD Expert
Euromonitor International
GEA market research
Proteus Insight
Finding new recipes for SUCOC
Changing dietary trends are prompting manufacturers of bakery products to explore alternative recipes. Substitutes for salt, sugar, and wheat have to provide the same sensory and functional properties as the original ingredients – but finding them is challenging and involves extensive testing.
What makes a fine loaf of bread so crusty and fragrant? For many of us, it's wheat or rye flour, water, yeast, and a pinch of salt. Maybe some sugar, and eggs or butter for a full flavor. But the use of these ingredients in bread, as well as in other baked goods such as cakes, biscuits and crackers, is increasingly being challenged due to dietary trends, food allergies and intolerances, and ethical considerations among consumers.

Nowadays, free-from products can be found in supermarkets all over the world. Mintel research reveals that 43 percent of American consumers deem foods with “free-from” claims healthier than foods without; for consumers who buy free-from products, 78 percent find trans-fat-free claims important, 71 percent preservative-free, and 57 percent sodium-free.

But simply leaving out these essential ingredients isn’t so easy. Salt and sugar, as well as the gluten in wheat, rye, and barley – typical ingredients of bakery products – all have sensory and chemical properties that make them difficult to replace.

FUNCTIONAL FLAVOR BOOSTERS
Take sodium chloride, or table salt: it plays an important role at almost every stage of baked goods production. Salt boosts flavor by adding taste and bringing out the aromas of other ingredients. It is key to yeast control, slowing down fermentation and enzyme activity in dough thanks to its hygroscopic abilities. In addition, salt tightens gluten structure to enhance dough’s strength, and limits microbial activity.

Sugar is also an essential ingredient in baked goods. Apart from delivering pure sweetness free from aftertaste, it offers many functional properties that consumers may not know about. For example, it drives dough rising by feeding yeasts, extends shelf life by inhibiting microbial growth, keeps baked goods moist, and provides them with an aromatic brown crust through caramelization and its reaction with amino acids – a process called the Maillard reaction. Of course, sugar also increases the volume of breads and cakes.

Likewise, the functional properties of gluten should not be underestimated. The resulting gluten network obtained when mixing wheat flour and water helps dough to rise, maintains its shape as it is baked, and creates its elastic, chewy texture. It also helps retain moisture.

THE PATH TO SUCCESS: TRIAL AND ERROR
To even come close to the properties provided by gluten requires blending various gluten-free flours that are made from rice, beans, oats, potatoes, or amaranth, as well as experimentation and fine-tuning. To replace salt, manufacturers can’t rely on any one solution. Some mineral salts offer a practical alternative; with similar physical properties, potassium chloride is the most cost-effective option for reducing sodium content. However, potassium chloride’s greatest disadvantage is its bitterness. One way to overcome this is to add flavors – but then again, many consumers are trying to avoid these, too. To maintain the sweetness of their products, bakers experiment with artificial sweeteners such as aspartame and natural sweeteners such as stevia. But both have their downsides, including a bitter aftertaste or a significantly longer sweet taste compared to sugar.
To refine their lists of ingredients, manufacturers can use testing labs. Here they can try out new substitute ingredients on small-scale equipment, simulating the entire production process under real conditions – to eventually find a recipe for success.

TEST THE BEST!

Every day, the testing labs at GEA’s Bakery Experience Center (BEC) in Torrebelvicino and Verona, in Italy, are busy carrying out production tests. Equipped with a wide range of baking equipment, such as mixers, depositors, filling machines, ovens, and packaging equipment, the labs simulate end-to-end production processes. In doing so, GEA supports customers to try out new recipes on small-scale equipment. A team of food technologists is always on hand to provide guidance throughout the testing process. With their expertise ranging from food chemistry to processing technologies, they assist customers in developing new recipes, and ensure a rapid time-to-market for innovations in response to new trends. In addition, recipes already in use can be evaluated at the labs for quality issues and shelf life. Extra support is available from a team of highly skilled technicians, who use their expert knowledge of GEA’s comprehensive portfolio to deliver tailor-made solutions that meet each customer’s needs – whether it’s stand-alone production lines or turnkey solutions.

The BEC team guides customers from start to finish, from selecting the right ingredients through to the knowledge transfer required to obtain the desired end product. Its service offering is complemented by site visits during installation and commissioning, as well as training for customers’ staff on how to use GEA equipment.
Meat processing pioneers in Kenya
Entrepreneurs in Kenya are ready to take the country’s meat and poultry processing industry to the next level. The family-run business Quality Meat Packers Kenya wants to revolutionize the local food market by producing high-quality chicken nuggets that are affordable for local consumers. To achieve this aim, they are leveraging state-of-the-art equipment and local meat processing expertise – rare assets in East Africa.

Walking through the food court of a shopping mall in Nairobi, relishing the smell of freshly cooked food, Imtiaz Velji gets a craving for crispy chicken nuggets. A native Kenyan of Indian descent, Imtiaz used to indulge in his favorite food during his college years in Boston, USA. “In Kenya, chicken nuggets are a rarity,” Imtiaz explains. “And if you do find them, they are very expensive – because they are usually imported from South Africa.”

Imtiaz knows the local food market very well – especially the meat processing sector. That’s because his father Diamond Velji founded Quality Meat Packers (QMP). Since its beginnings in 1970, the company has evolved from a small butcher’s shop to a fully integrated agribusiness with operations ranging from rearing cattle, lambs and chickens, to slaughtering, processing and packaging a wide variety of meat and poultry products. With 500 employees, QMP is the largest family-owned meat and poultry processing firm in Kenya. Imtiaz is the company’s Business Development Manager.

“Some time ago, I discussed new business opportunities with my father and my brother Ifhaan”, says Imtiaz. “And we came up with the idea of producing chicken nuggets right here in Kenya. Enthusiastic about the endeavor, we drafted a business plan right away and did all the necessary market research. However, we weren’t sure if we would be able to find a local partner to support us who had the necessary processing expertise.” Just as Imtiaz was about to abandon the idea, his father got in touch with Marvin Borkus, GEA’s Head of Sales Food Processing and Packaging in Southern and Eastern Africa.

Not long after, Imtiaz showed Marvin around the first floor of QMP’s premises in Nairobi. What used to be a storage space was set to become a production hall with a high-tech processing line. “When I first talked to Imtiaz and his father, they weren’t sure which equipment would be right for them,” Pepijn Brouwers, Project Manager for large-scale projects at GEA, recalls. “I suggested they visit our GEA Technology Center in Bakel, in the Netherlands, so they could see our poultry processing lines and all the different kinds of products they can produce for themselves.” Imtiaz and his father also visited a processing company in South Africa to see a GEA poultry processing line in operation – one that was very similar to the solution they would later install. “That was the turning point for us. It’s when we realized we could do this,” says Imtiaz. “But the decisive factor was that GEA has a local office in Nairobi, with experts who would be available whenever we needed support.”

A few months later, GEA installed a processing line at QMP for producing chicken nuggets and other breaded poultry products. It has been customized to meet the needs of QMP and for operating under local conditions. The line is the first of its kind installed in East Africa. “It wasn’t an easy task – the local infrastructure in particular was an obstacle,” Pepijn says. “But we mastered the challenges fairly quickly, specifically thanks to the close cooperation between GEA entities, departments, and QMP. We worked hand in hand with QMP during the entire project. This really helped us to deal with any cultural differences and manage the expectations of all the parties involved.”

“We’re not yet running at full capacity, but we will be soon. We’ve just launched our new products with all the major retailers in Kenya,” Imtiaz explains. “With more affordable prices, I’m sure chicken nuggets will soon be in high demand – they’re just too good not to be, aren’t they?”
Saving precious water

As water becomes increasingly scarce, many industries are investing more time and resources in reducing water consumption and finding ways to recycle water. In particular, the dairy industry is playing a pioneering role in these efforts. Using state-of-the-art technology, the water contained in milk can now fulfil the demand of an entire processing plant.

In New Zealand’s idyllic Waikato region, water supply doesn’t appear to be a pressing issue: This fertile region enjoys high rainfall all year round. Still, boosting resource efficiency is a key objective of the region’s food industry. With a water content of 88 percent, fresh milk provides an ideal basis for creating a processing chain that’s independent of a well. Dairy company Yashili’s latest infant formula plant in Pokeno, for example, uses very little external water. Thanks to technology provided by GEA, the company extracts most of the water it needs to operate the plant from the fresh milk that’s been processed – keeping both its environmental footprint and disposal costs low.

In regions where water is scarcer, companies have gone one step further with help from GEA technology: the world’s first dairy plant that doesn’t rely on external water sources opened in a dry region in the Central Mexican Plateau in 2014. Each day, the operating company extracts one million liters of water from the total 1.6 million liters of milk processed there. The water is then used during production. Afterwards, 600,000 liters are treated a second time for non-potable use. The company is now investing in additional zero-water milk processing plants in the USA and Brazil.

NON-POTABLE VS. POTABLE WATER
The recovery technology for non-potable water is relatively straightforward: The condensate from a plant’s evaporation effects is collected as “cow water” and purified in a reverse osmosis plant. Reverse osmosis technology uses a semi-permeable membrane to remove unwanted molecules and ions from water. Until recently, no further processing was required, with the recovered water simply used in cleaning or other operations with no product contact.
However, the current trend is to take the recovery process one step further – so that the water can be used to clean tanks and pipework, or even used in products themselves. To achieve this, purification via reverse osmosis is not sufficient.

“If recovered water is to come into contact with a product, it requires a totally different approach,” explains Mark Braun, membrane technology expert at GEA in Hudson, Wisconsin. “The system must have a sanitary design, with sanitary tanks and piping. In fact, we must treat the water in the same sanitary way as we do the product itself.” This also requires the complete water recovery system to be cleaned on a regular basis, using the same Clean-In-Place (CIP) chemicals and regimes that would be used to clean a product system. Moreover, rigorous monitoring procedures must be implemented to continuously check that the recovered water meets the required quality standards, allowing any deviation to be investigated and corrected immediately.

Water processed in sanitary systems can be purified to meet WHO standards for potable water. “In all instances, the recovered water is either chlorinated or treated with chlorine dioxide to provide residual bactericidal action,” says Braun. “However, to meet specific needs, additional processes can be employed – for example, using carbon treatment to remove unwanted odors, or UV treatment to provide additional hygienic security,” he adds. It may not always be possible to cost-effectively or efficiently purify all recycled water to standards that will permit its use in processing. This residue could still be used to water gardens or flush toilets – water that would otherwise have been drawn from external sources.

“In the near future, all new dairy plants could run entirely on milk, leaving environmental water sources untapped,” Braun predicts. But water-saving and recycling technologies can also be deployed in existing plants. And as more and more water reuse initiatives are being applied very successfully in the dairy sector, the same technologies could also be applied to other sectors of the food industry that require high volumes of water for processing.

Global water consumption has been increasing at TWICE the rate of population growth over the last century.

By 2025, 1.8 BILLION PEOPLE will be living in countries or regions with absolute water scarcity, and two-thirds of the world population could be under stress conditions.

ONE IN NINE people worldwide don’t have access to improved drinking water sources that, by nature of their construction or through active intervention, are likely to be protected from outside contamination.

80% of sewage in developing countries is discharged directly into water bodies, untreated.

20% of global water consumption is for industry, 70% for agriculture, and 10% for domestic purposes.

SOURCE
UN Water
Olive oil is both tasty and healthy – no wonder it is such an essential part of the popular Mediterranean cuisine. And as global demand soars, olive oil manufacturers are on the lookout for new solutions to help them generate higher yields more efficiently.
The olive was discovered more than 6,000 years ago in the Eastern Mediterranean region of the Middle East. Today, it is the most extensively cultivated fruit crop in the world, according to the UN’s Food and Agriculture Organization. Growers value its high tolerance to drought and salinity and its minimal maintenance requirements, while consumers cherish the olive for its high nutritional value. Nutritionists attribute its health benefits to its characteristic fatty acid composition, but also to micronutrients such as tocopherol antioxidants (vitamin E), and, most importantly, phenolic compounds. Olive oil that is classified as “extra virgin” – which means that it has been extracted solely by mechanical means and meets all required chemical and organoleptic parameters – has the most beneficial composition of saturated and unsaturated fatty acids of all edible oils. Olives and olive oil are essential parts of the Mediterranean diet, and their consumption is seen as one of the primary factors in low rates of coronary heart disease as well as prostate, breast, and colon cancers in the region. While residents of the Mediterranean Basin consume large amounts of high-quality olive oil, less premium types are in high demand in emerging markets.

OLIVE OIL IS BOOMING

Olives are being cultivated on more than 11 million hectares across 56 countries and all five continents – but it’s being consumed in 169 countries. Since the mid-1990s, global consumption per capita has risen by 33 percent. And given the growing world population and consumers’ increasing health awareness, the demand for olive oil is set to grow further. Manufacturers are increasingly looking for technological innovations to help them boost yields while using fewer resources. And this requirement is also reflected in the fact that olive oil has become a field of study in its own right: in Spain, for example, the University of Jaén and the International University of Andalucía offer postgraduate programs dedicated to olive oil. GEA supports both programs.

ENGINEERING FOR HIGHER YIELDS

Technological developments have had a significant impact on industrial olive oil production over the last 50 years. Until well into the 1970s, it was standard practice to squeeze the olives using hydraulic presses after crushing, stirring, and heating them. To separate the liquid extract into oil and water, a small disk separator or static sedimentation tank was used – a complex procedure with low output. A few years later, the separation process was optimized using a 3-phase decanter. This 3-phase technology involves diluting the olive pulp with water, allowing the oil to be separated from the solid matter and water – a cost-effective method, but one which requires large volumes of fresh water and produces a lot of waste water.

The introduction of the 2-phase system was a major milestone. Developed in the early 1990s by GEA, this system does not require additional water for dilution, and produces less waste water as a result. It delivers high yields at premium quality. Because it is a cold process where no water is added, fewer ingredients and flavors are washed out, preserving all the healthy components of extra virgin olive oil and its full, aromatic taste.

LESS ENERGY, PREMIUM TASTE

GEA’s latest generation of decanters is focused on reducing energy consumption – another major challenge in olive oil production. By optimizing the energy-intensive aspects of a decanter’s operations – such as drive, control, and regulating systems – and by adjusting the design and depth of the pond, GEA has cut energy requirements by 50 percent compared to earlier generations. With the new decanters, olive oil can be produced with less water and energy than ever before – all while offering consumers a premium flavor.

It is also possible to optimize resource efficiency when treating olive paste, also called orujo – a waste product of olive oil production. To do this, GEA has developed a special process in which the solids are separated from the liquids with a 3-phase decanter and the water is treated with an evaporator. This process cuts energy consumption by over 25 percent compared to conventional treatments, plus the solids can be used as a fertilizer or animal food, and the resulting water can be used to irrigate the field.

The rapid uptake of innovations in processing can help olive oil manufacturers stay ahead of the game – which is essential in light of the limited arable land available and an increasingly competitive market.

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Food loss is a pressing issue throughout both industrialized and developing countries. The food processing industry can help reduce the millions of tons of food lost every month by making their manufacturing processes more efficient.

Preventing food loss is high on the agenda of the United Nations’ Food and Agriculture Organization (FAO). They estimate that around 1.3 billion tons of food stuff are lost or wasted globally every year. This equals one third of all food produced for human consumption (FAO, 2011). According to their definition a significant part of food loss is food waste: the removal of food from the food supply chain although it is fit for consumption, or which has spoiled or expired. Studies highlight that food loss and food waste happen in different ways, taking place at different stages of the food supply chain and in different parts of the world. In developing countries, most loss occurs post-harvest, during processing. In industrialized countries, a lot of food is lost early in production and a very large part of it is wasted at the consumption stage. Overall, the Swedish Institute for Food and Biotechnology (SIK) estimates that the per-capita food waste by consumers in Europe and North America is 95–115 kilograms per year. Furthermore, the later the stage at which food is lost, the greater the loss. This is because energy is invested at every stage of the supply chain. As a result, as the FAO points out, resources such as water, land, energy, labor, and capital are increasingly squandered.

INCREASING EFFICIENCY, REDUCING LOSS

300,000 tons of mangos – at one point fragrant, juicy, and sweet – rotted away in Kenya in 2014. The mangos were lost for a simple yet weighty reason: they could not be processed fast enough. Save Food, a global initiative for the reduction of food loss and food waste, started a project to help mango farmers reduce the losses using modern and packaging technologies. They also came up with new product ideas, such as pulped or dried mango for export. The project’s target is to decrease the loss by 30,000 tons of mango by 2017.

Minimizing food loss at the early stages of production, in developing countries in particular, requires the establishment of appropriate cooling facilities, infrastructure, and packaging systems. This will help increase yield while saving resources.

There are also ways to reduce loss at different stages of the food supply chain in industrialized countries. First of all, producers can invest in the most
efficient plants, aiming not only to make energy and water savings, but also to minimize the loss of food during the manufacturing process. Preventing loss during manufacturing can be done in various ways. For example, there are processing techniques that increase the yield from juicing apples or allow the juicing of end parts and peels, such as advanced separation and filtration techniques; slicers that can handle longer product rolls for cold cuts and cheese, thus avoiding end parts; and surface treatments that create surfaces so slick that products can’t stick to them. Modern separation, homogenization and modified atmosphere packaging (MAP) technologies significantly extend shelf life, making it possible for retailers to sell products for a longer period of time. In addition, the latest packaging technologies ensure that food stuffs can travel long distances safely.

Making production processes more efficient can have a major impact on reducing food loss around the world. Above all, managing food loss is about adopting the right attitude – and the right technology.

SOURCES
save-food.org
fao.org
gea.com
Bites in bottles

Grab a bottle and go: in today’s fast-paced world, a growing number of consumers are relying on drinks furnished with fruit and cereals to provide them with a burst of energy. The drinks’ main selling point? They are quick and easy to consume, and give consumers the sense that they’re eating a healthy meal that won’t weigh them down.

For a good start to the day, very little beats a lavish breakfast. For an Englishman, it might be eggs with sausage, bacon, beans, and mushrooms. The Chinese might enjoy crullers and meat-filled steamed buns with warm soy milk. In Germany, people embrace fresh bread, cold cuts of ham, butter, cheese, and jelly.

But, let’s face it – most mornings are not that laid-back. When we’re on the go, a quick snack might have to do the job. In the Far East, a growing number of consumers are turning to liquid meals for a rapid burst of energy. Drinks containing solid food not only quench the thirst, they can also serve as a meal replacement – and they are quickly becoming popular in the West, too.

Drinks containing solid food not only quench the thirst, they can also serve as a meal replacement.

TO BE TREATED WITH CARE

The classic example is orange juice containing pulp and fibers. But with the current trend, a variety of other solid ingredients are being added to milks and juices – including coconut, nuts, aloe vera, berries, and cereals. Taste and texture are crucial to the success of these products: consumers compare the drinks to the full-bodied flavors of freshly squeezed juices, chewy peaches and pineapples fresh from the fruit aisle, and crunchy cereals. More and more consumers are also paying increasing attention to nutritional values, and looking to avoid additives and preservatives. Additionally, a long shelf life is beneficial for both food retailers and customers wishing to stock up on quick and healthy bottled meals.

These demands can be balanced through gentle processing – extending a drink’s shelf life without the need for preservatives, while avoiding any unnecessary stress on the delicate ingredients inside. For health-conscious customers, this means better and more readily-available options whenever they crave a quick, nutrient-rich boost.
Drinks containing solid ingredients – such as pulps and fibers, berries, and cereals – are growing in popularity all over the world. To ensure the very best product quality, liquids and solids should be treated separately. Here’s how that works in practice – from preparing the raw ingredients, to combining them in bottles.

**SOLIDS & LIQUIDS**

**SOLID PREPARATION**
Solid ingredients are usually delivered either as a compote in a carrier fluid or in chunks. If ingredients are delivered dry, they need to be mixed with a carrier liquid before undergoing further processing, such as pasteurization and aseptic filling.

**LIQUID PREPARATION**
Liquid components are often prepared beforehand – juices, for example, by deaeration, the addition of ascorbic or citric acid, or homogenization.

**SOLID HEAT TREATMENT**
For solid pieces such as fruit chunks, a significantly longer pasteurization process than for liquids is required to reliably kill microorganisms within the core. Treatment temperature and time depend on the texture and size of the solid pieces.

**LIQUID HEAT TREATMENT**
For a long shelf life, microorganisms – including dormant spores – must be killed or inactivated. When doing so, a product’s taste, texture, and nutritional profile should be affected as little as possible. For fruit juices, pasteurization at a minimum temperature of 85 °Celsius for 20 to 30 seconds is ideal to protect consumers and minimize any damage to the product’s quality. Less acidic liquids, such as vegetable juices, need to be heated to higher temperatures.
**BALANCE TANKS**
Both solid and liquid ingredients pass through aseptic balance tanks before filling – this prevents re-contamination and avoids the need for further pasteurization when an ingredient waits in line.

**ASEPTIC FILLING**
In the final step, juice and fruit chunks, or milk and cereals, are combined in a single bottle. Aseptic filling is usually the method of choice because it’s energy-efficient, preserves nutrients, does not affect a product’s taste, and is suitable for filling lightweight PET or HDPE bottles. Moreover, it’s ideal for milk-based and low-acidic drinks.

**4a PISTON DOSING**
Using a state-of-the-art aseptic filling system, bottles are filled in two steps. First, a piston doser extracts the desired volume of solid particles from the tank and injects them into the empty bottle – ensuring the filling nozzle doesn’t touch the bottle neck, to maintain aseptic integrity.

**4b VOLUMETRIC FILLING**
Then, the bottle moves on to a volumetric filler, where the juice or milk-based liquid is added and the aseptic process completed. After capping, the bottle is ready to be labeled and delivered to retail stores.

**ASEPTIC FILLING**
GEA’s Aseptic Piston Doser PX is the first system to support aseptic filling using lightweight PET bottles, and it handles other bottle types as well. The system can maintain a production capacity of 800 bottles per minute (48,000 per hour). All sanitation and sterilization cycles are automated.

**HEAT TREATMENT**
Plate heat exchangers are compact and transfer heat with high efficiency, allowing for exceptionally gentle treatment of liquids and high processing volumes. For treating products containing particles, pulp, and fibers, however, GEA’s VARITUBE® Tubular Heat Exchangers are the top choice. For example, the multi-tube system VARITUBE® M is suitable for products comprising solid particles, which could clog up traditional plate heat exchanger setups.
Featuring: Robert Spurway, Chief Operating Officer Global Operations, Fonterra, New Zealand
Fonterra’s story began in the early 19th century when European settlers brought the first cows to New Zealand. What do you believe to be the most important drivers for Fonterra’s sustained success?
Our co-operative model, and a shared focus across the business and among its farmer shareholders to deliver the best returns for the co-operative. Fonterra was formed under legislation to help consolidate the New Zealand dairy industry and create a co-operative capable of competing on a world stage, and with that scale came an owner’s mindset that continues to shape our business decisions and the decisions our shareholders make on their farms. It can be seen across every aspect of our business, from our continued push into value-added products, to our leadership in health and safety, and commitment to more sustainable dairy practices.

From a geographical perspective, what are the major challenges facing the New Zealand dairy industry?
Traditionally, Fonterra’s supply chain has been well set up for dry goods, however, as our focus continues to shift more toward value-added items – specifically consumer and foodservice products which are marketed on their freshness – we are identifying new challenges.
We have put a lot of time and effort into reducing our time to market by aligning production and shipping schedules, working with regulators in market to expedite certification and putting in place new systems and processes internally that drive velocity.
We have seen good progress in this part of the business recently, and have cut down lead times for products such as our Waitoa-made UHT products, which now have the shortest lead time to China.
Over recent years we have also developed global milk pools to bring us closer to China, Europe and Latin America, as well as establishing strategic joint ventures and partnerships to give us access to more raw milk and dairy ingredients and stronger distribution channels in these markets.

What were the key milestones – for instance, in terms of technical evolution in processing steps – for the New Zealand dairy industry?
The introduction of electricity and refrigeration in the late 19th century.
allowed movement of milk from farm to factory and, soon after, these technologies were applied across the industry to enable refrigerated shipping, on-farm cooling and cream separation. In the mid-20th century, the advent of the herringbone shed and milk tankers brought with them dramatic expansion in dairy: bigger farms, more milk moved longer distances with vast improvements in efficiency. Evolutionary steps began to focus more on improvements in technology and cost efficiencies: large scale milk powder dryers, introduction of automation, improved quality control systems. The dairy industry is on the cusp of its next technical evolution, with the world wanting fresher dairy products faster than ever.

China’s demand for dairy products is constantly growing and New Zealand is a major exporter of dairy products to China. How is Fonterra preparing to meet this growing demand?

China is, by some way, Fonterra’s largest market, so winning globally means winning in China. Demand in China will continue to grow in the long term, as their government strongly encourages dairy consumption which, at per capita rates today, is well below many other developed countries.

To achieve this, China will need to grow its supply of raw milk. It will also need to continue to import dairy products to balance its food security priorities.

Our approach in China is to develop an integrated business that spans a wide range of consumer and ingredients products. This includes a local supply of fresh milk from our farm hubs, a strong foodservice presence and increased consumer exposure for our branded products driven by the Anmum and Anchor brands.

The dairy industry has seen a long history of innovation. Which trends do you expect to trigger the innovational spirit of the industry in future?

We have already seen the beginning of the ag-tech (agriculture technology) revolution, with most farms now managed from a mobile device, savvy farmers using drones to apply fertilizers faster and more accurately, and the emergence of social media as a tool giving farmers better access to information that can improve their businesses.

We need to embrace new technologies, operate in and own our own new platforms where customers and consumers want to engage with us, and find innovative ways to use technology to highlight our competitive advantages.
Always on the move

Alvaro Martínez, GEA’s Regional Head of Western Europe, the Middle East and Africa, spends much of his time traveling the globe to meet colleagues and customers.

At 8.45 a.m. Outside there’s bright sunshine and it’s 34 °Celsius. Alvaro Martínez grabs his jacket and rushes from his car to the next air-conditioned space, in an effort to escape the summer heat of Madrid, Spain. Relieved, he enters his office which is cooled to a comfortable 19 degrees. As he pushes down his notebook’s power button, his assistant Raquel enters the room. Alvaro is responsible for steering and developing GEA’s business in Western Europe, the Middle East and Africa. Catching up with Raquel ensures he’s always on top of things. Together they review his calendar for the day and make any necessary adjustments for unexpected appointments.

Alvaro joined GEA almost 20 years ago as a Process Automation Engineer. Now one of his main responsibilities is liaising between business areas and country organizations. As a morning person, he likes to schedule meetings and calls for early in the day. “For me, this is the ideal time to look at current business challenges, country reports, and market insights.”
Alvaro’s team is based in six different time zones, so trying to align timings is challenging. But Alvaro values in-depth exchange with his colleagues out in the regions. “First-hand insights allow me to keep my finger on the pulse of our customers’ markets across the various regions,” he says. “It goes without saying that we need to know about our customers’ needs. But it’s no less important to constantly observe and identify the needs of our customers’ customers. The continuous and clearly structured flow of communications within GEA helps us quickly translate these needs into valuable solutions.”

“One of our colleagues believes that the best way to observe and identify the needs of our customers’ customers is through first-hand insights. “First-hand insights allow me to keep my finger on the pulse of our customers’ markets across the various regions.”

Because he tries to adapt to his colleagues’ working hours across the different regions as much as possible, Alvaro is often busy at lunch time in Madrid, which begins at around 2 p.m. If he has time, he likes to go out for lunch with colleagues. Today, however, he’ll be having lunch on the plane. He packs up his briefcase with his notebook, tablet, cell phone, and sets of business cards in different languages. Back in the parking lot, he grabs his suitcase from his car’s trunk and jumps into the backseat of the waiting taxi. “Al aeropuerto, por favor,” he says, as he picks up his tablet to respond to an email from one of his colleagues in Lagos, Nigeria.

After a short drive, the taxi stops at Terminal 1 at Madrid Barajas International Airport. Alvaro heads straight to the security line. His itinerary: Istanbul – Tehran – Dubai. “Needless to say, I am out of town a lot. I am traveling two to three weeks every month,” Alvaro explains, flipping through the various boarding passes stored on his phone. “I want to get a true feeling of what our customers are experiencing in their markets and make sure I’m in touch with our sales managers out in the field.” Alvaro’s flight is right on time and departs promptly at 12.10 p.m.

A few hours later, Alvaro is sitting in an office in Istanbul discussing contractual details for the supply of a beverage plant with a new customer. At 9 p.m. – when his day’s work is done – he and his business partners go for dinner together in the city’s Sirkeci District. Alvaro opts for Karides Güveç – a shrimp stew with mushrooms and tomatoes that’s baked with cheese. “It’s amazing that I get to taste all these local cuisines. This dish is really delicious – certainly one to remember.”

On his way back to the airport hotel, tiredness sets in. But the day went well; Alvaro is content. At the reception desk, he quickly requests a wake-up call for 7.00 a.m. After reaching his room, Alvaro removes his tie and checks his emails one last time. No to-dos for now. At around midnight, he draws the curtains, turns off the bedside lamp, and goes to sleep.

The next morning, Alvaro is booked on a flight to Tehran. His schedule for the next few days is focused around a food and beverage technology trade show. Various GEA technologists and application experts will be attending to showcase their products and solutions. “We’ve been active in Iran for many years. With its sanctions lifted and demand for processed foods and beverages on the rise, the country offers plenty of opportunities for us,” Alvaro explains. “I’m looking forward to meeting our customers there face-to-face and catching up with my colleagues.”

At 8.15 a.m., he’s exiting the hotel lobby through the revolving door, when his phone rings. It’s Raquel. Alvaro’s flight has been delayed by one-and-a-half hours. They discuss which of his meetings to postpone due to his later arrival. After their conversation, Alvaro takes a deep breath, thinking about how to best use his unexpected free time. He decides to make a few phone calls he had planned for later in the day. But first, he unlocks his tablet. “¡Buenos días! ¿Cómo estás?” he asks, smiling at his kids on the screen. Alvaro tells them about the delicious meal he had last night. With Alvaro as their father, they are growing up as culinary cosmopolitans – and they love shrimps. After another quick chat with his wife, who has been waiting patiently for their excited kids to pass on the tablet, he gets back to business, making some phone calls and studying the Iran Country Report, which the GEA Market Intelligence team has prepared for him. At 9.45 a.m. he arrives at the departure hall – ready to take off into the clouds once again.
ART IN ENGINEERING
Hidden beneath a shiny stainless steel housing, the multi-zone cooking area represents the beating heart of the GEA CookStar. In this sophisticated, three-phase cooking oven, vertical and horizontal airflows distribute hot air and superheated steam. As a result, the CookStar supports steaming, cooking, roasting, smoking, and drying. Its patented airflow concept enables both more rapid cooking as well as increased capacity and more consistent product quality. It also reduces total operating costs through energy savings, faster cleaning times, and lower maintenance costs.
Undoubtedly there has been a shift to healthy snacks – or at least, snacks that are perceived to be healthy. Whilst sweet biscuits struggle, Mondelēz’s belVita brand has grown by 183 percent in a five year period. That is just in Western Europe – globally, the brand has become a priority for the company, achieving nearly 700 million US dollars in sales in 2015.

There are two main reasons for this success: first, the brand has adequately positioned itself in opposition to unhealthy snacking products, promoting itself as a low-fat, low-sugar source of energy. Second, the brand has stolen sales from breakfast meals, particularly cereal, as time-poor people who work longer hours and fit more into their day tend to ignore set mealtimes and opt for a less rigid structure.

But “healthy” is an amorphous term – is a belVita biscuit “healthy” because it is not chocolate, or does a product have to have legitimate, certified health benefits to be considered healthy? This looseness of terminology is something that manufacturers have been able to capitalize on, with Kellogg’s and Mondelēz, for example, promoting their products as generally healthy without possessing specific claims; Nakd promotes its products as gluten, wheat, and dairy-free, appealing to the recent popularity of free-from products.

And more recently, products such as Clif are promoting high-protein energy bars, targeting gym-goers and hikers.

With these examples, it is possible to divide healthy snacks into three categories – “health neutral” snacks, which tend to be free from certain ingredients (Nakd); “general wellness” products which tend to suggest snacking as part of an overall healthier lifestyle (belVita); and “health positive” products, such as Clif, which tend to target specific audiences and aim to provide actual health benefits. These snack categories will be where the majority of new sweet snack products will be focused over the next five to 10 years.