

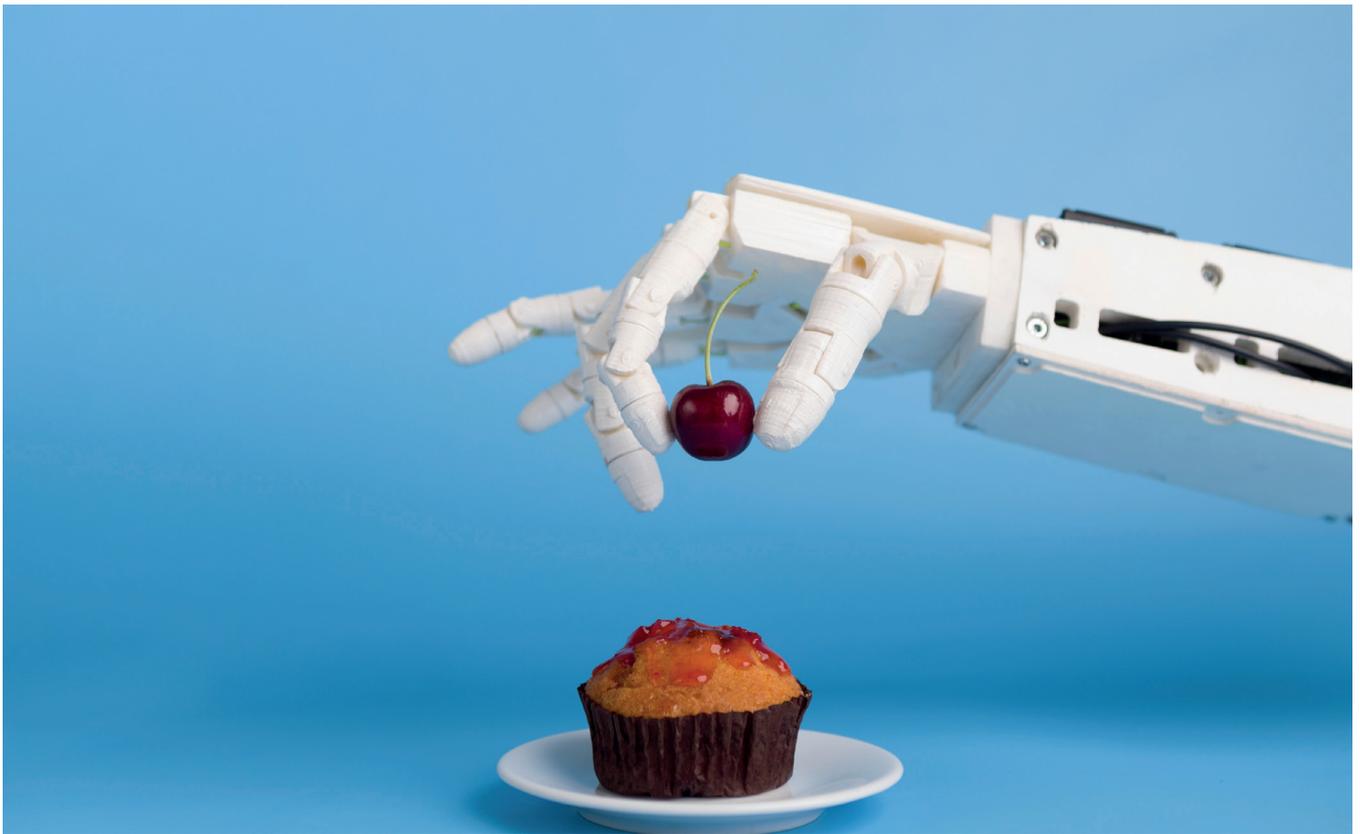


Trends & Needs
Forecasts & solutions
for the Food and Bakery
Industry 2024

Trends + needs in food production

DIOSNA trend report for the food and bakery industry 2024





2024 trends shaping the food and bakery industry

Read the DIOSNA trend report for the food and bakery industry to find out how consumer trends are influencing the industry and

- [how to optimize production efficiency and flexibility](#)
- [how to install levers for a more sustainable production](#)
- [and how to compensate for employee and specialist shortages.](#)

In this guide, **vitamin and protein manufacturers** find out how efficiently they can organize their solids production. For **manufacturers of bars and baked goods**, this publication provides forward-looking digitization and automation solutions for mass and dough production. Producers of baked goods will also learn about levers to reduce fat, sugar and salt the natural way while maintaining a tasty and fresh product and why the use of pre-doughs and sour-doughs is a must of tomorrow.

Less fat, salt and sugar - more fitness:

How to maintain quality and taste in healthier baked goods

Less salt

Cereal products, especially bread, are the main source of salt in human nutrition. Worldwide, an estimated 1.28 billion adults aged 30 to 79 suffer from high blood pressure. One of the global targets in the field of non-communicable diseases is to reduce the prevalence of hypertension by 33% between 2010 and 2030 (WHO).

Salt is an important ingredient in bread production and reducing it can have a negative effect on bread quality. One way to reduce salt is to add a yeast starter, which requires an overnight development. During this long period of time also 'wild' sourdough microorganisms develop and form flavor components. As organisms form natural flavor compounds that also support a salty taste the addition of salt can already be reduced this way. But salt not only contributes to taste but also to the network structure of a baked good. As the process of kneading has a great impact on network structure too, the optimization of the process itself as well as product-dependent choice of ideal mixing equipment or tool is essential. Thus, an ideal gluten network can be achieved with the right kneading process despite salt reduction.

A „clean label“ solution for reducing salt is the use of sourdoughs strengthening the gluten network. Just as known from ascorbic acid (vitamine C) which is commonly used in large productions as bread improver or dough conditioner. The use of sourdough can compensate it and thus

reduce the amount of salt required, as sourdough in combination with NaCl improves the perception of the salty flavor and aroma. In their review *Codină et al.** describe the benefits of sourdough in low-salt products and its use as promising strategy to produce healthier food. They claim that sourdough counteracts the effects of salt reduction on bread flavor leading to good sensory properties of the product, such as the crumb structure. It was also reported that the addition of sourdough fermented with *Lactobacillus amylovorus* during low-salt bread production would extend the shelf life compared to a control sample. Bread containing lactic acid bacteria (LAB) from fermented wheat germ tasted saltier compared to a reference bread without LAB. It is assumed that the salty flavor is based on a combined effect of souring and proteolysis.

By adding a sourdough made from rye malt fermented with glutamate, in which bacteria of the species *Lactobacillus reuteri* have accumulated, the salt content of the bread could possibly be reduced from 1.5 % to 1% (compared to flour), and still contain flavor and other characteristics of a consistent bread quality. Thus, reaffirming that sourdough improves the perception of the salty flavor and provides additional aromatic compounds. This makes sourdough a useful functional ingredient for bread with low salt content. In addition, sourdough can be used not only in bread, but also in pastries or croissants to improve their flavor, texture and therefore aroma.



* Codină, G.G.; Voinea, A.; Dabija, A. Strategies for Reducing Sodium Intake in Bakery Products, a Review. *Appl. Sci.* 2021, 11, 3093. <https://doi.org/10.3390/app11073093>



Less sugar & fat

Alongside high blood pressure, diabetes is one of the most common diseases worldwide. Together with hyperlipidemia, i.e. high fat and cholesterol levels, these diseases form the metabolic syndrome. Metabolic syndrome is one of the most important risk factors for cardiovascular diseases, which are particularly favored by the Western lifestyle consuming a lot of salt, sugar and fat alongside too little exercise. For decades bon vivants struggled with poor or artificial taste baked goods. Today this tragedy finds its end as sugar and fat can also be reduced in baked goods without sacrificing flavor.

Industrial sugar can be reduced by using a thermal pre-dough. The DIOSNA AromaStück®, for example, is a thermally produced pre-dough. By adding flour, groats, or seeds together with a special pre-dough starter (DIOStart® Aroma) and water into a respective plant (e.g. DIOSNA Aroma Ecoline) after a defined development time, many

aroma components and natural maltose form an unmistakable taste profile. Maltose is formed from starch during the swelling process when flours, groats and seeds are broken down enzymatically.

The addition of both sugar and fat can be drastically reduced by this process. The AromaStück® can also be combined with microorganism-driven sourdoughs and produced in DIOSNA pre-dough systems.



More flavor, more freshness and longer shelf life

The benefits of pre-dough

The demand for healthier, more natural „clean label“ bakery products as a growing trend can be met both by a growing range of „clean label“ baking ingredients and by versatile (pre-)dough technologies. Thanks to a well thought-out integration of pre-dough technologies, bakers have many options to respond to this trend with creative, tasty products. In addition to the reduction of salt, sugar and fat the ph-decrease through the use of sourdough enables the extension of shelf-life, freshness, and mould retardation of the baked goods. Further benefits that contribute to the characteristics of a premium product achieved by the use of pre-dough are:

- ➔ More aroma
- ➔ More freshness
- ➔ Better crumb
- ➔ More naturalness
- ➔ Better stability for the freezing process

The precondition for successful product sales is a consistently good consumer experience. Various factors play a role here. One of them is the reproducibility of the specific sourdough with its specific parameters. Particularly in connection with lactic acid bacteria, the strictest possible standardization is recommended to always achieve the same result. One method is the use of starter cultures, as these are standardized and tested. At the same time, the wide range of different starters offers many possible applications. For example, milder starter cultures can also be used for baked goods that are not initially considered as sourdough options, such as croissants or brioche. For example, the DIOSNA starter for a mild wheat sourdough can be used to produce croissants. In addition to the optimized relaxation behavior of the dough and a dry dough surface, the croissant has a more intense, buttery aroma and tastes fresher.

The following table is supposed to give an impression of the possible pre-dough and sourdough applications for various products and advantages.



Bakery products of global significance and the technological as well as product advantages achieved by the use of pre-doughs/sourdoughs

Pre-dough/Sourdough	Bakery product	Advantage
Wheat sourdough	Flat bread	<ul style="list-style-type: none"> • Gluten strengthening • Storage improvement
	Hamburger bun	<ul style="list-style-type: none"> • Gluten strengthening • Freezing stability • Clean label option
	Hot dog bun	<ul style="list-style-type: none"> • Crumb elasticity • Deep freezing storage stability • Clean label option
	Pretzel	<ul style="list-style-type: none"> • Gluten strengthening • Stress stability • Improved dough relaxation • Suitability for automatic lines • Aroma
	Sandwich bread	<ul style="list-style-type: none"> • Crumb structure, softening
	Croissant	<ul style="list-style-type: none"> • Optimized relaxation behavior of the dough • Dry dough surface • Suitability for automatic lines • Aroma
Wheat sourdough (mild)	Pastry (Danish)	<ul style="list-style-type: none"> • Optimized relaxation behavior of the dough • Dry dough surface • Suitability for automatic lines • Aroma
	Toast bread	<ul style="list-style-type: none"> • Crumb stability • Aroma • Clean label option
Wheat sourdough (strong)	Pizza	<ul style="list-style-type: none"> • Improved dough relaxation • Suitability for automatic lines • Aroma • Re-integration of rest dough
Wheat sourdough (mild or strong)	Wheat bread	<ul style="list-style-type: none"> • Gluten strengthening • Storage improvement • Aroma



Recycling in the bakery industry

About the reuse of bread and dough leftovers

Steps towards a more sustainable dough production can start by returning leftover baked goods and dough to the process. One option is the production of a slurry. Here, leftover bread and dough are chopped up in appropriate machines and mixed with water. This slurry can then be added back to the main dough. Another solution is the integration of an additional fermentation process, e.g. with the help of a sourdough starter. Companies such as DIOSNA offer patented starter cultures such as DIOStart Wheat Bread Fermentation for this process, enabling for a more economical use of ingredients.

Products that are cut out from dough, such as pizza or croissants, produce a large amount of dough scraps. Based on bread fermentation, dough scraps can be mixed with the main sourdough and fermented for a short time. This is how 20 to 25% of the total dough weight can consist of fermented dough scraps.

The use of fermented dough in products such as croissants is applied by more and more bakeries with a proportion of around 7% mild sourdough to noticeably enrich the buttery taste of croissants saving salt, fat and dough.



Another lever for outstanding baked goods:

Optimization of water adsorption

Haptics, taste and freshness are not only determined by the raw materials, but also by the water content. The amount of bound water plays an important role for each individual recipe. For example, water ensures the formation of gluten, the protein structure that among others is responsible for the consistency of the dough and the bread volume by gelatinizing the starch.

Water also influences the temperature of the dough. This is also decisive for excellent baked goods quality. The right amount of water also ensures that baked goods stay fresh and edible for a longer time. Less water absorption affects the consistency of the dough as well as the hydration and dispersion of the ingredients. If there is not enough water, this results in a lack of volume and a drier and denser crumb.

Optimal water absorption in the dough is determined by the amount of water added and the processing method. The right choice of process makes it possible to achieve doughs with a 3 - 5 % higher water content. The increased water absorption of doughs improves the quality and taste of the result.

➔ Kneading technology can promote water absorption

To achieve optimum kneading and dough development, various types of mixers are available, such as spiral, horizontal, high-speed or wendel mixers.

With a DIOSNA spiral mixer, around 2% more water can be added to the dough. The wendel mixer compresses and stretches the dough between its two wendel tools and presses it against the bowl wall. This achieves a water absorption of 3 - 5 % for most doughs, especially for flours with a medium protein content. In addition, the kneading time is significantly reduced compared to spiral mixers, resulting in less dough heating and the production of more dough batches per hour.

Each dough has different requirements depending on the target product, which must also be considered when selecting the mixer.

High-protein food: Efficient production

More and more people are living a sportier lifestyle. Protein intake to support muscle building is currently an essential part of the media and gyms. Also, the supermarket shelves are filled with high-protein products. These range from protein shakes to bars, yogurts and breads. Protein is also considered to be particularly filling and is therefore often associated with weight loss. Food and nutritional supplements can be defined as high-protein products if at least 20 % of the calories are derived from protein.

Protein powder is used in many snacks and foods. There are various sources for protein powder. The most popular are proteins such as whey, casein and plant-based proteins. Whey protein contains many essential amino acids and has a high bioavailability. It is therefore considered as the best choice for athletes to build muscle. The proteins are obtained using various processes such as microfiltration (whey), acid precipitation (casein) or by extraction from various plant sources. The production process varies, from soaking and grinding the plants to extracting the protein through a filtration process.

The production of high-protein products is not always easy. When producing bars or bread, a rubbery to sticky consistency and later a very firm consistency (firm bars) can pose challenges for production. The **Irish University College Cork**, School of Food and Nutritional Sciences together **with Fraunhofer Institute** for Process Engineering and Packaging, **and the APC Microbiome Ireland** performed a „*Comparative analysis of plant-based high-protein ingredients and their impact on quality of high-protein bread*“*. The group analyzed dough properties (gluten-aggregation, pasting behaviour, rheology) as well as bread quality (volume, crumb structure, crumb hardness). The high-protein ingredients were found to affect gluten-aggregation, pasting and bread characteristics. Results indicated a weakened gluten-network in doughs containing potato and pea protein. Also pasting behaviour was mostly affected in the manner of potato protein suggesting a heat induced improvement of its baking performance. Good bread quality, represented by high specific volumes and low crumb hardness, was observed for gluten, zein and carob. Breads with pea, lupin and faba bean showed only slightly inferior quality. However, coming back to kneading technology special processing tools and optimized process logistics are often necessary. In addition, speed and homogeneity are required in bar production, as protein powders are often hygroscopic and clump quickly. High-protein bread, on the other hand, can be kneaded slowly. The bakery industry usually uses plant-based protein. Kneading or mixing processes can be optimized for efficient production.

The production of protein bars, for example, can be improved efficiently in two simple production steps. Mixing the powder content with a high-shear mixer can be done in just a few minutes and is therefore significantly faster than conventional mixers. Processing a heavy bar mass usually is not easy and quite challenging e.g. with regard to the stability of the kneading tools, the kneading power needed for an efficient process but also the release for further processing and logistics. It is also beneficial if the mixture does not heat up too much. If ingredients such as fruit or chocolate are included, these must remain intact so that gentle kneading is necessary at the same time. A good solution here is offered by so-called wendel mixers, whose mixing tools rotate counterwise and knead the dough masses vigorously and quickly at the same time. The additional integration of a frequency inverter ensures flexible and powerful application with relatively low heat generation. In automated transfer logistics, consistency should always be taken into account in order to minimize product loss. This includes elevator, tipper, and hopper devices with scraping tools or similar, from which the bar mass can be transferred from the kneading bowls to the next station for further processing.



* Manuscript version of: Hoehnel, A., Axel, C., Bez, J., Arendt, E. K. and Zannini, E. (2019), Comparative analysis of plant-based high-protein ingredients and their impact on quality of high-protein bread', Journal of Cereal Science, 89, pp. 102816 (8 pp). doi: 10.1016/j.jcs.2019.102816; <https://cora.ucc.ie/server/api/core/bitstreams/89c62742-2d56-4c0f-aa70-8b0a5b5987e3/content>

More product variety, more efficiency

AGV and smart room concepts for more flexibility

Until now, industrial production on a large scale has mostly been based on mono lines. Many manufacturers on this scale have so far relied neither on dough resting nor on the integration of sourdoughs. Today, many food manufacturers are expanding and developing their product portfolios. The bakery industry increasingly integrates pre- and sourdoughs in their recipes. Furthermore, the same goal applies to all manufacturers of food and nutrition: the need to expand their level of flexibility and production reliability as this is crucial for a future-proof positioning.

But how can one move away from the mono line, at least for the premium segment, so that the product range can be adapted to the ever more flexible market requirements?

- Integration of smart transport vehicles with lifting function: automated guided vehicles (AGVs) operating driverless and recipe-controlled move bowls away from and to different pick-up and destination stations. The lifting function enables lifting into and out of racks.
- Smart space-saving concepts: The dissolution of rigid structures and production lines can be made possible by AGVs, as these can operate freely in space. They enable for the implementation of bowl storages - e.g. for dough resting - instead of area increasing storage, for example.
- The dissolution of rigid production structures in combination with space-saving room concepts also enables the implementation of smaller production lines.

- As e. g. dough processing via an automated linear system does not allow to access the system during ongoing production e.g. for cleaning in preparation for a batch size change the combination of independent working plants, dosing stations etc., with agile transport vehicles results in an immense reduction in downtimes as there are no access restrictions. A mixer can easily be taken out of the AGV supply chain for cleaning and to be reintegrated after again.

AGV is short for Automated Guided Vehicle. AGVs have been used successfully in a wide range of industries for many years. They drive independently, navigate freely and driverless within an area and transport raw materials, bowls and boxes to the required location with high precision and efficiency within defined work processes. Linked to a bowl management system, they offer maximum efficiency, flexibility and process reliability.

In jobs with physical strain and challenging working hours, staffing levels are getting thinner and thinner. Physical strain is often followed by physical effects and sometimes even limitations. The use of AGVs can counteract staff shortages and relieve the physical strain on existing personnel. The equipment with low and high lift function allows bowls and boxes to be lifted into storage shelves. This results in a regulation of space requirements and smart space-saving concepts offer new possibilities, e.g. for implementing a dough resting station.

The digitalization of recipe-related bowl logistics simplifies the process overview and reduces the risk of errors. The use of AGVs also gives fully automated companies more flexibility with regard to innovative space-saving concepts and the implementation of new premium products.



DIOSNA E-Guide **„Bowl Management & New Logistics“**

Find out how efficient manufacturing can be improved through intelligent logistics planning, how digital bowl management can increase process and production reliability and which system is suitable for your needs using the example of dough production.

www.diosna.com/landingpages/agv-e-guide-en-download



Choosing the right mixer is essential

Last but not least, efficiency in dough, mass, and powder production are determined by the choice of the right kneader or mixer. The choice of the right system depends on its range of use, the desired batch output, quality and efficiency. Cleaning should also be easy, as this is decisive for downtimes. In addition, simple operating and an intuitive control system makes operations easier. Simple and comprehensive monitoring of kneading and mixing curves, product temperature, frequency, and recipe status, for example, is very important for an optimum in quality management.

Choosing the right type of mixer depends on the respective product and therefore increases the success rate for precise conversion. Kneading or mixing type, frequency, force, type and temperature are the decisive factors for differentiation. In case of kneading the implementation of a frequency inverter enables kneading at different frequency levels and therefore the processing of different types of dough, mass, and others.

The type of kneading, e.g. vertical spiral kneading or kneading with wendel tools, determines the energy and water input, the mixing of the ingredients, the temperature, etc. But also, the distance between the kneading tool and the bowl wall (in the case of wendel mixer also the distance between the tools) is decisive for quality, as this determines the force and surface with which the dough is pulled apart, pressed together or pressed against the bowl wall. The choice of the right mixer for powdery products is much easier. Important factors are the level of homogeneity, mixing speed, temperature and less dusting opportunities. All this - and more - should be discussed between respective technologists and product designers on both the manufacturer's and equipment supplier's side.



Conclusion

The 2024 trends for the food industry are diverse and can be found on the part of both end consumers and manufacturers.

A healthier diet plays a major role for consumers, particularly in the context of various illnesses such as high blood pressure, diabetes, cholesterol, intolerances, and intestinal health. But also, many healthy people feel the need to feel fitter and to support an appropriate lifestyle. The reduction of salt, fat, and sugar in baked goods. The use of whole meal flours and seeds support this lifestyle and nutritional requirement. Sustainability and naturalness also play an important role in the choice of baked goods.

For the food industry, high quality, an individual, aromatic taste, suitability for freezing and freshness as well as an increased protein intake, in addition to responding to trends, continue to be of crucial importance for remaining stable in the market. In this context, staff shortages represent a challenge for efficiency that needs to be compensated for or counteracted. This is not always possible due to the availability of staff on the labor market, but also due to illness and vacation.

If manufacturers in the food and bakery industry want to meet these demands the following topics can be solutions for a viable future:

- the integration of pre- and sourdoughs
- the reintegration of leftover dough and bread
- the digital management of production and its logistics (e. g. recipe, process-dependent bowl management)
- the automation of production logistics (e. g. with automated guided vehicles - AGVs)
- the use of durable high-performance mixers that have a positive impact on dough quality and are highly flexible in terms of frequency and efficient production of high protein products and powders
- the integration of Wellness or feel-good premium products in smaller batches
- the production of baked goods that either have a longer shelf life or can be frozen easily and retain their quality after defrosting or baking

About us

DIOSNA - Quality Made in Germany

All under one roof: DIOSNA machine engineering and technology are used worldwide in the processing and production of solids for the pharmaceutical and food industries. The product portfolio includes mixers, granulators, dryers, coating systems, fermentation systems and kneading machines for research, pilot and industrial production. It also offers a wide range of solutions for the most important processes in dough production, from dosing to pre-dough preparation and kneading through to transfer logistics - for research, pilot and industrial production.

Product development with the customer, process planning and optimization, project management, after-sales and value added services are continuously optimized yesterday, today and tomorrow with a focus on our customers.

This is why DIOSNA customers have valued quality, performance, expertise and philosophy for over 135 years.

Author: Dr. rer. nat. Jessica Kyereme-Flaspöhler, Marketing, Diosna Dierks & Söhne GmbH

About the Author: Dr. rer. nat. Jessica Kyereme-Flaspöhler, obtained her doctorate from the Faculty of Biology and Biotechnology at Ruhr University Bochum in 2015. She then worked as a marketing product manager in the pharmaceutical industry before joining DIOSNA in 2019 as Head of Marketing. She is currently responsible for the written content of the DIOSNA portfolio.

DIOSNA Dierks & Söhne GmbH

Am Tie 23, 49086 Osnabrück, Germany
+49 541 33104-0
info@diosna.de
www.diosna.com

