



*Flexible.  
Efficient. Secure.*

*Solutions for  
the innovative,  
future-oriented  
dough production*

# Bowl Management + **new logistics**

**Dough production 4.0:** How process reliability and efficiency can be increased in a future-proof way.





## **The Future is now:** Digital bowl management and agile transport fleets

Economical and future-proof - two simple words with great significance for every company. A major challenge in the current global economic situation, but nevertheless possible. No matter whether you are a medium-sized bakery or a large industrial company: With the logistical optimization of production processes and procedures, the minimization of errors and the safeguarding of personnel shortages - in summary, the increase in process reliability, efficiency and the associated profitability can be steered towards a more secure future.

This e-guide is primarily intended to show medium-sized and large industrial dough producers the advantages of the following production upgrades:

- ➔ **Digital bowl management system in manual production**
- ➔ **Partial automation**
- ➔ **Full automation with free transport vehicles**  
(compared to batch production in a linear transport)

## Meeting demands

The demands on the baking industry and its end products are high - both from the industry itself and from consumers:

- High product variety
- Slow-baking
- Reduced use or even elimination of additives and salt, fat or sugar
- Keeping products fresh for as long as possible
- Longer shelf-life
- Products in „Eat Out At Home“- quality
- „feel good“- products that make the consumer feel fitter or healthier

This applies to bread, pizza, buns, bagels, etc. - and the lifespan of products varies more than ever depending on trends. Meaning that planned market availability must be extended, shortened, or expanded more quickly than usual.

Today, many bakers and manufacturers are therefore focusing on expanding and further developing their product portfolio. Pre-doughs and sourdoughs are also increasingly being integrated into production. In addition, dough resting is playing an increasingly important role, even for companies working at full capacity.

The diversification of the portfolio and/or production capacities requires detailed planning and investments, usually also in personnel.

### Questions to be clarified:

- Do products have to be removed from the list to establish new products?
- Is the technological as well as the technical expertise sufficient?
- Is sufficient personnel available?
- How much space is needed and will new premises be necessary?
- How fast can production take place? In context of:
  - o Personnel availability
  - o Downtimes due to cleaning, product changes, breaks
  - o Processing capacities of the machines
- Can several products be produced simultaneously?
- Is a frequent product-batch change economical enough?
- How can production be solved logistically and the susceptibility of processes to errors be reduced?



**But how should a company position itself to continue working as efficiently as possible in the future and at the same time create solutions for the challenges and trends of our time?**

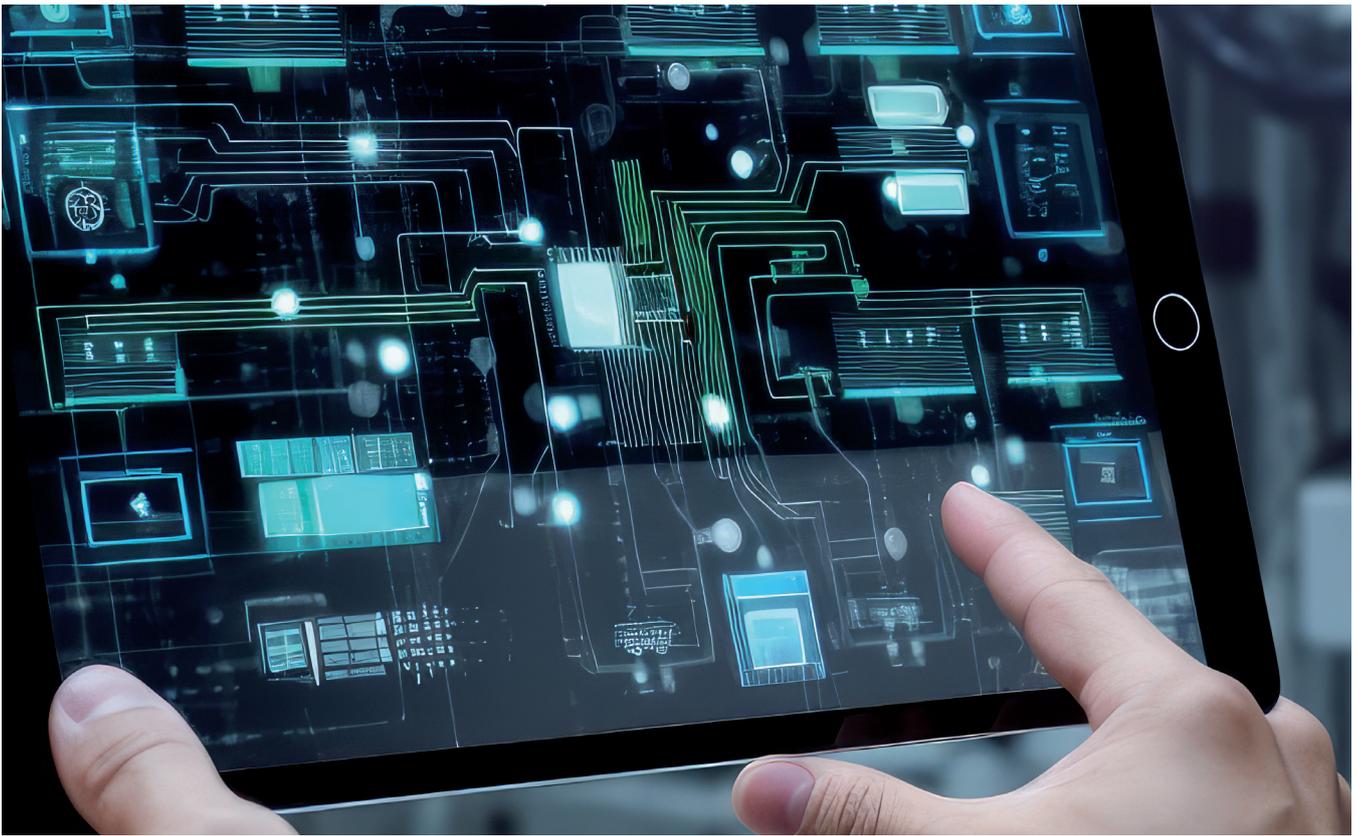
The solution lies in the implementation of smart logistics and intelligent management systems, among other things. Two application examples are described below to illustrate possible solutions:

- a) how a medium-sized dough production facility, which was previously managed manually in terms of logistics, benefits from the integration of a smart bowl management system
- b) how an automated batch-based dough production system enables the integration of a new product line by switching logistics to a smart automated guided vehicle system (AGV)

## The medium-sized bakery

In a bakery that has integrated dough resting as an integral part of its recipes there is a lot to manage, to co-ordinate and to move. To always obtain the same product quality, it is particularly important to adhere precisely to the time-based recipe specifications. One-, two- or three-shift production requires very good process planning for error-free transport of the bowls between the individual stations, such as dosing, pre-dough plants, dough resting, and kneading as well as further processing steps or cleaning. All this needs to be well managed and timed: production times, cleaning times, rest times, break times and, if necessary, product changes.





## Process management - Digitization

The digitization of recipes based on a planning tool, additional bowl registration for tracking and an alarm function for moving the bowls reduces the probability of errors to a considerable extent. The so-called **RFID - TAG** (radio-frequency identification) describes a transmitter-receiver system for the automatic identification and localization of objects. A combination of transponder and code that is recognized by a reader. With this proven method, which can be easily combined with an AGV system, the respective bowl locations and the recipe stage of the dough are precisely detected and recorded. Based on the recipe the digital manager indicates when and where a respective bowl must be moved for further processing of its content. This increases production reliability and optimizes the traceability of batches.

It is also possible to detect that a bowl has been moved to the wrong position or has not yet been moved to the correct position. A visualization shows where the bowl needs to be transported to, and a confirmation prompt simultaneously verifies that the task has been completed.

All new DIOSNA systems and machines capable for automation can be equipped with these options. The DIOSNA Bowl-Manager is therefore an excellent solution for any manufacturer who wants to minimize errors and increase production reliability in addition to equipping with new pre-dough and/or kneading systems. A DIOSNA service employee can determine whether existing machines of the actual production are suitable for this upgrade via retrofit.

## Smart transport logistics with AGVs

The automation of dough production logistics with digitally controlled bowl transport vehicles, so-called AGV (Automated Guided Vehicle) systems, represents a major step towards production reliability.

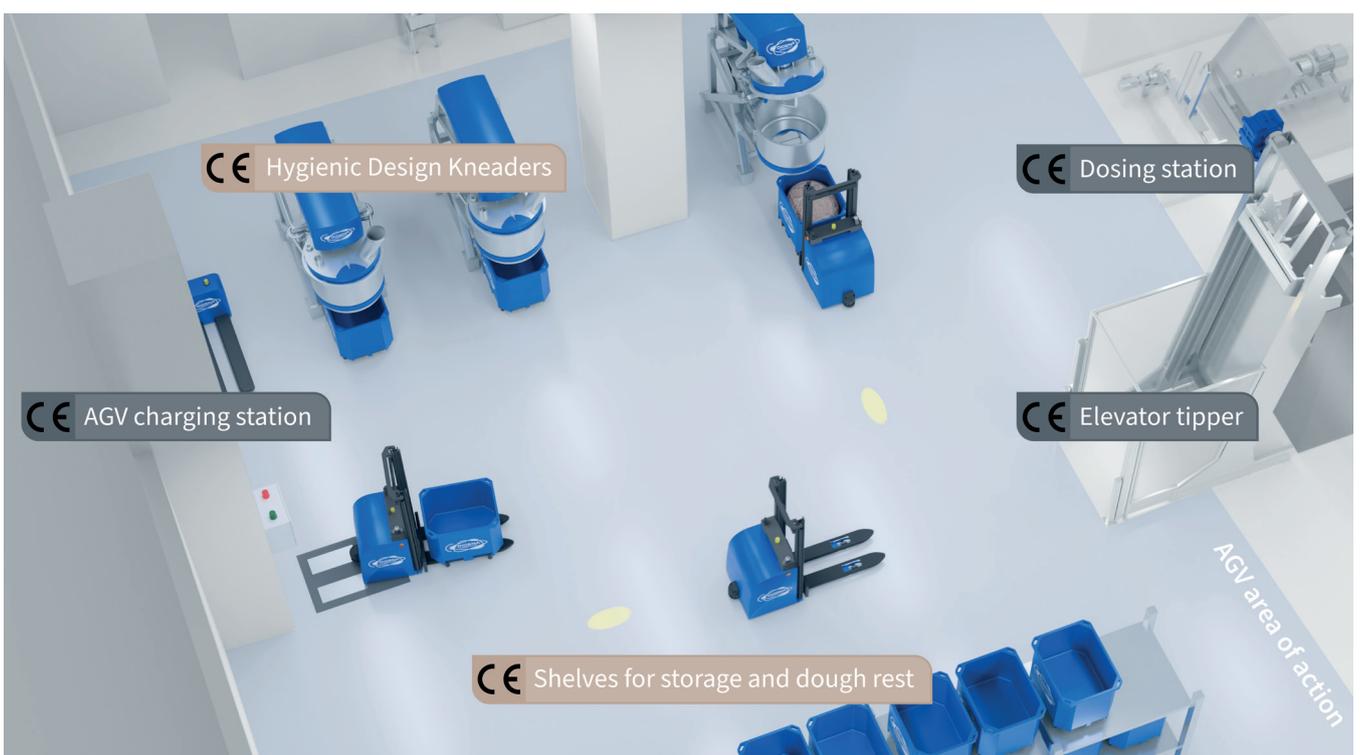
AGVs navigate freely without a driver. Equipped with sensitive sensors, they are intrinsically safe and recognize obstacles and people. They are controlled by a fleet manager, which is linked to the bowl manager described above.

The task of the AGVs is to transport bowls of several hundreds of kilograms to defined locations. These are determined on the one hand by the defined recipe sequence (e.g. dosing, mixing and kneading, resting, kneading, etc.) and on the other hand by defined logistical process specifications. So, if mixer 1 and its bowl need to be cleaned after the tenth kneading run, e.g. to prepare for a product change, the AGV can take the bowl for cleaning. If a defined cleaning time is specified for the respective mixer in the processing schedule, either the same AGV or another one brings the next bowl from the dosing station or from the warehouse to the mixer after the cleaning time has expired and the next dough can be produced.

## Production safety

Fault management can also be implemented. If, for example, a mixer malfunctions, the system can be instructed to use the next free, suitable mixer. The basic requirement for this procedure is the corresponding number of mixers, AGVs or recipe unit durations that allow this.

Another aspect worth mentioning about production safety is the equalization of employee availability and the simultaneous protection of the employee's physique. If fewer or even no bowls which are particularly heavy need to be pushed by employees, this not only reduces the risk of injury but also the potential for accidents.





## Space saving

The AGVs can be equipped with both a low-lift and a high-lift function ( $\leq 2.8$  m - corresponding to three shelf heights). The aim is to expand the height function and thus reach even higher levels. Thanks to the high-lift function, bowls can be stacked in shelving systems with several levels for storage purposes or to rest the dough. If the production facility has the appropriate room height, a lot of space can be saved and utilized differently.

As the AGVs can navigate freely in the room, detect obstacles, and avoid it, it no longer matters how dosing stations, pre-dough units, mixers, cleaning stations, storage stations, etc. are arranged. This can save even more space. From a logistical point of view, it is generally important to organize the process as smartly and directly as possible and to avoid crossovers and long routes to be able to act as quickly as possible.

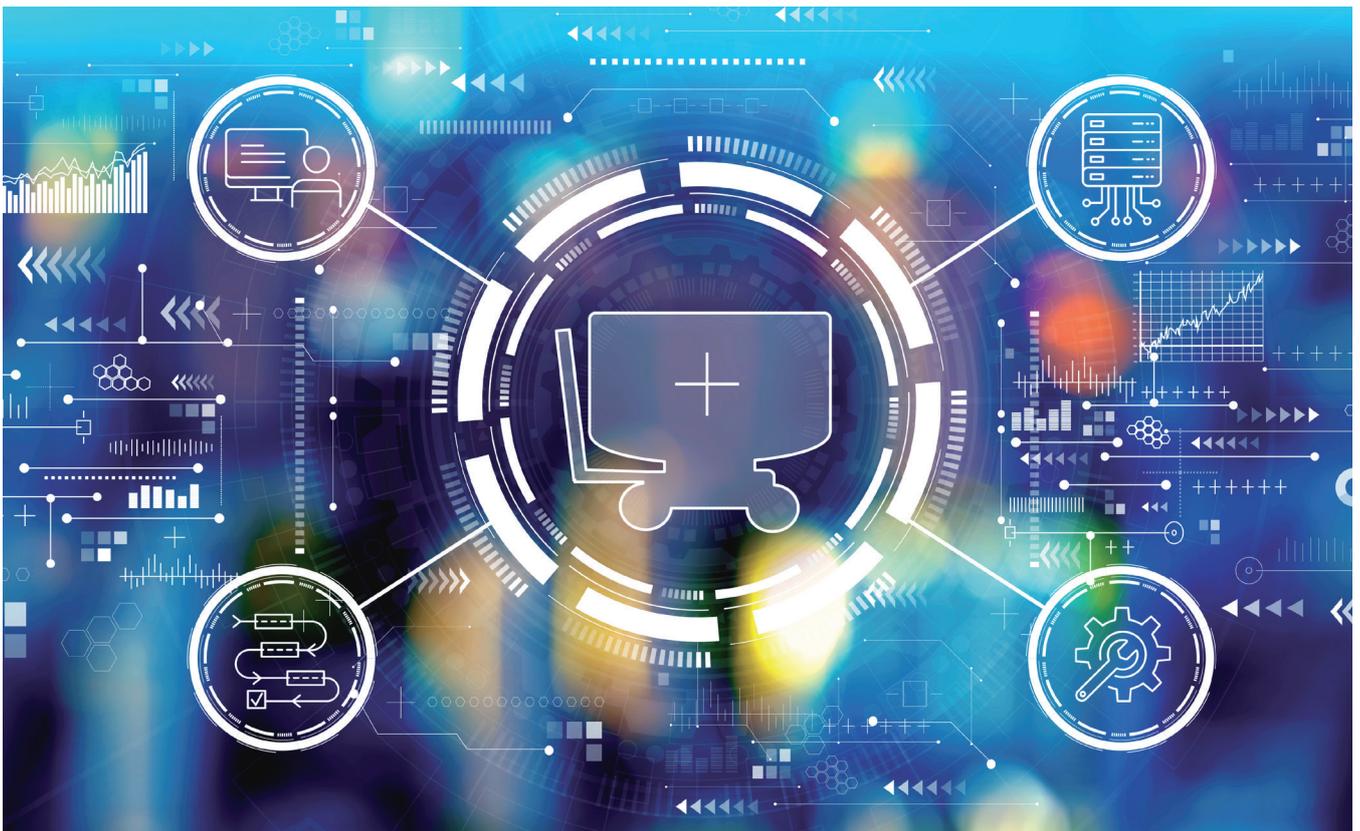
## The industrial production

### „Next Level“- full automation

Until now, industrial production on a large scale has mostly relied on mono lines. Many manufacturers of this size have not yet focused on dough resting nor the integration of sourdoughs. However, the subsequent integration of dough resting systems or sourdoughs into existing systems represents a major challenge. But with the trend reversal that emerged a few years ago and continues to progress, many companies are expanding their portfolio, adapting recipes, and looking for more flexibility. Away from the mono line, at least in the premium segment, in order to adapt the product range to the increasingly flexible demands of the market.

Fully automated manufacturing sites still rely on linear transport systems for their batch production. These offer several advantages. Once set in motion, a large batch quantity can be produced in multi-shift operation with process and quality reliability. The transfer logistics guarantee orderly further processing and only a small number of personnel is required to start the production.

➔ So why switch to AGV systems?



## Significantly reduce production downtime - increase production turnover

A linear transport runs in a 24/7 production. Individual components of the line as well as the entire line need to be cleaned. Either purely for hygiene purposes or for batch size changes. Assuming an average **cleaning time for hygiene purposes** of seven hours per week, this results in 364 hours of cleaning time per year - or in other words, a production loss of around 4.3%. As cleaning during the production process is not possible, the entire system must be stopped. The situation is different in a AGV-based production, as the logistics work independently and individual units can be taken out of the production chain for a short time if they are not needed. To avoid delays, respective personnel must stick to the defined cleaning times. Besides that, it is also possible to intervene in the process and replace individual mixers.

This can be set in the Bowl Manager. Individual management is also possible, e.g. already integrated stations can be logged on and off here. In addition, completely new stations can be added to the system via the fleet manager.

A **batch size change** in linear transport requires several steps that take more time in total shutting down the system, cleaning and starting up the system. Assuming a working week of 12 hours, this amounts to 624 hours per year and therefore a production loss of around 7.3% per year. The independent operation of AGV logistics and the resulting flexibility can reduce the production loss to  $\leq 0.3\%$ , i.e. by 7 %.

**Example:** 4 mixers knead **product A**. The batch size change is imminent. AGV 1 is instructed to take bowl 1 from mixer 1 to the cleaning station. Mixer 1 is cleaned in the meantime. Mixers 2, 3 and 4 continue to work and are given processing tasks. After depositing bowl 1 in the cleaning station, AGV 1 picks up bowl 2 from mixer 2 and takes it to the elevator tipper. At the same time, AGV 2 lifts a bowl from the dough resting rack and takes it to mixer 2, which can now continue kneading **product A**. During this time, AGV 1 is on its way to the bowl store and brings a new bowl 3 to the dosing station for dosing **product B**. Once the ingredients of the new **product B** have been dosed into bowl 3, it is brought to mixer 1 by AGV 2. The batch size change has been completed for mixer 1 and can now take place for mixers 2-4 in the sequence just described.

In short, AGV-mediated process logistics in dough production offers a noticeable increase in production capacity for fully automated operations. The solution for companies that want to focus on a larger product segment in addition to their mono lines in the context of market development. It also gives them greater flexibility, not only in terms of increasing product diversity, but also in terms of production set-up and space management.

For existing DIOSNA linear transport systems, there are several retrofit options for converting to an AGV-guided production. A service team will determine whether and which options are available.



## Summary

### **Digital management and AGVs: a solution for personnel shortages and more efficient production with a high degree of flexibility**

Particularly in professions with physical strain and demanding working hours, staffing levels are getting thinner and thinner. Physical strain is often followed by physical consequences and sometimes even restrictions. The use of AGVs can counteract the lack of personnel and relieve the physical strain on existing personnel. Thanks to its low- and high-lift function, the automated guided vehicle can also lift bowls into storage racks. This results in a regulation of the space requirements. The digitization of recipe-related bowl logistics simplifies the process overview and reduces the risk of errors. Even without an AGV, the sole bowl management system supports production operations and is available as an option when purchasing new industrial mixers and pre-dough systems. The DIOSNA bowl management system works hand-in-hand with the fleet management system that DIOSNA has developed together with established logistics software companies and is continuously being upgraded.

By using AGVs, fully automated companies also gain more room for maneuver regarding innovative space concepts and the implementation of new premium products. This saves downtime and increases production turnover.

About us

## **DIOSNA - Qualität 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.

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**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.

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