

PRODUCTION STUDY 2026

From Premium Flavor to Precision Automation

How Bakery Trends Reshape Dough Production



Why this Matters?

Dough systems sit at the heart of industrial bakery operations, yet they're facing more variability, complexity, and performance demands than ever before. From clean label sourdoughs to allergen-free formulations and data-driven quality control, bakeries must now reconcile product innovation with process discipline. Understanding this shift is vital to shaping tomorrow's ingredient handling and dough-making technology.

From Premium Flavor to Precision Automation: How Bakery Trends Reshape Dough Production

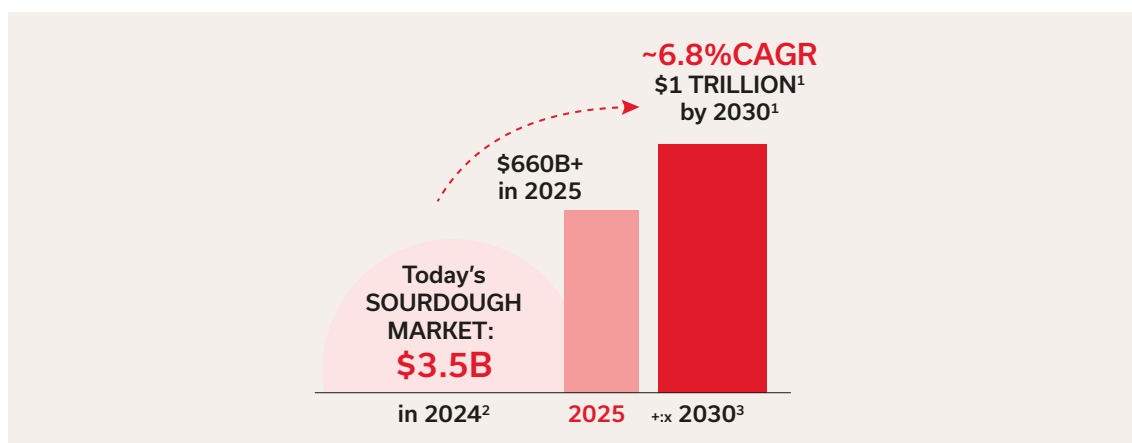
The global bakery sector, already a \$660+ billion market in 2025 and projected to approach \$1 trillion by 2030¹, is expanding rapidly as consumer demand evolves toward premium, convenient, and diverse formats. The *sourdough segment* alone, valued at roughly \$3.5 billion in 2024, is expected to exceed \$6.3 billion by 2033² with a ~6.7% CAGR, as artisan-style and slow-fermented formats gain mainstream appeal. Meanwhile, the *gluten-free bakery market*, a key driver of allergen-safe innovation, was estimated at \$7.5 billion+ in 2024, with forecasts suggesting it could reach **\$11–13 billion by 2030**³.

At the same time, bakeries face structural operational challenges. In Europe, the working-age population (ages 20–64) has declined by ~5 million over the past decade⁴, tightening available labor pools. In the UK specifically, food manufacturing has seen a ~40% drop in EU-national labor⁵ in recent years.

North America likewise reports persistent labor shortages, with over **615,000 unfilled food and beverage manufacturing positions in 2023**⁶.

Industry diagnostics further indicate that ingredient waste in high-volume lines can reach up to 12% or more without precision dosing⁷, a substantial drag on productivity and margins.

Together, these dynamics underscore a critical inflection point: bakeries must adopt more accurate, automated, hygienic, and data-connected dough production systems to maintain quality, efficiency, and growth in an era of product complexity and workforce constraints. This white paper explores those trends in depth and outlines the technological imperatives ahead



1 Global Bakery Products Market Report, 2024–2030, Statista & MarketWatch

2 Straits Research: Sourdough Market Report (2024)

3 Strategic Market Research: Gluten-Free Bakery Products Forecast (2024–2030)

4 BusinessEurope Analysis of Labour & Skills Shortages (2023–2024)

5 Zeelo UK: Brexit & Labour Loss in Food Manufacturing (2023)

6 Tutor Intelligence Blog: Adapting to Labor Shortages (2023)

7 Baking Business: "Waste Reduction for Pizza Lines Depends on Accuracy" (2025)

1. Executive Summary – Reimagining Dough Production

The global bakery industry is evolving at high speed, shaped by the demand for better flavor, more natural ingredients, and a wider variety of dough-based products. Consumers are embracing premium sourdoughs, clean-label pastries, gluten-free bases, and novel snack formats. These product expectations, in turn, are triggering deep operational changes for industrial bakeries.

To stay competitive, bakeries must adapt with smarter, cleaner, and more flexible technologies. From ingredient handling and pre-dough systems to dosing accuracy and automation. The pressure is on to reduce waste, improve hygiene, enable traceability, and ensure process repeatability.

This white paper outlines the **five dominant trends currently reshaping the dough-making process**. It draws from industry publications, bakery reports, and technological case studies to identify the real impact of these trends on equipment design and process engineering. We then highlight how Spiromatic's solutions respond directly to these shifts, enabling bakeries to scale innovation, enhance sustainability, and prepare for a more automated and complex dough future.



2. Trend Map: What's Driving Dough System Transformation?

The transformation of dough production no longer starts inside the bakery, it starts with the consumer. Changing generational behavior, shifting retail formats, and evolving expectations around quality and transparency are fundamentally redefining how dough must be produced.

Younger generations, particularly Millennials and Gen Z, evaluate food differently than previous cohorts. Price alone is no longer decisive. Value now includes **transparency, sustainability, ingredient integrity, authenticity, and experience**. Premium is not simply "more expensive", it signals better ingredients, ethical sourcing, responsible production, and alignment with personal values. When younger consumers choose a product, they increasingly ask themselves whether it is worth consuming at all. Consumption must "count".



This shift has direct consequences for dough production. Bakeries are confronted with rising demand for specialty flours, sourdough processes, long fermentations, clean-label formulations, plant-based variations, and regional adaptations. Recipes are becoming more diverse and more complex. Ingredient quality expectations are increasing. Traceability is no longer optional.

At the same time, **mobility patterns** are changing. Electric vehicle charging hubs, service stations, and public transport centers are evolving into high-frequency consumption environments. Younger generations purchase food more often in convenience-driven locations and consume more frequently throughout the day. This drives demand for smaller portions, ready-to-eat bakery formats, and rapid product rotation. For producers, this means more SKUs, smaller batches, shorter cycles, and greater flexibility requirements.

Customization culture further amplifies complexity. Younger consumers expect choice. Variation and limited editions reduce boredom and allow identity expression. Brand loyalty may be lower than before, but brand positioning and product distinctiveness

have never been more important. In practical terms, this translates into continuous recipe innovation and portfolio expansion. Dough systems must therefore accommodate frequent changeovers, precise multi-ingredient dosing, and scalable flexibility without sacrificing consistency.

Interestingly, the younger consumer does not inherently distrust **industrial production**. Having grown up in a digital world, Gen Z often associates advanced automation with hygiene, precision, and reliability. The paradox is that many large-scale dough producers hesitate to highlight the sophisticated technologies that allow them to produce artisanal-quality dough at industrial scale. In reality, automation is not in conflict with authenticity, it enables it. Controlled fermentation, accurate hydration, sensitive ingredient handling, and full traceability are only achievable at scale through advanced systems.

All these developments converge into a clear operational reality: more recipes, greater ingredient diversity, higher quality standards, increased documentation demands, and stronger sustainability expectations. Dough production is shifting from volume-driven standardization toward **flexible, premium-oriented, data-driven manufacturing**.

Consumer trends are no longer a marketing consideration. They are redefining engineering priorities.

Here is an overview of trends we noticed during the last year:

Trend Area	Examples & Industry Signals
Product Innovation	• Premium sourdoughs and long fermentation • Growth of filled pastries, frozen laminated goods • Morew flavor-rich and hybrid dough concepts
Sustainability Pressure	• Ingredient waste reduction targets • Water and energy efficiency • Preference for hygienic, cleanable systems
Ingredient Complexity	• Use of hydrated flours, soaked grains, live cultures • Gluten-free, allergen-free formulations • Cocoa replacements, sugar alternatives
Labor & Automation	• Operator scarcity and rising wages • Push for hands-free cleaning and dosing • Remote control and diagnostics becoming standard
Digitalization	• Real-time recipe tracking, batch-level traceability • Mixer feedback integration • Downstream QA feedback from make-up lines to upstream ingredient dosing systems

Interpretation: Making Sense of the Trend Map

This trend map illustrates how five macro-level forces are converging to reshape dough production. While each trend is distinct, their impacts often overlap, amplifying complexity across the process.

For instance, the move toward premium sourdoughs and filled pastries increases recipe variability, which drives the need for more precise dosing and pre-dough fermentation control. At the same time, sustainability concerns push bakeries to reduce ingredient losses and switch to hygienic, low-maintenance systems. Meanwhile, automation and digitalization are no longer optional, they are essential to maintain productivity and traceability with fewer skilled operators.

These interconnected pressures call for a modern dough-making ecosystem that is **accurate, automated, and adaptive**, one that Spiromatic is helping engineer.



3. From Market Requirements to Engineering Solutions

As bakery products become more premium, diverse, and operationally constrained, dough processing technology is under increasing pressure to deliver **precision, repeatability, hygiene, and flexibility** simultaneously.

The consumer and operational trends described earlier translate directly into new engineering requirements for ingredient handling and dough preparation systems. Modern bakeries must handle more complex formulations, tighter quality specifications, and greater production variability, all while operating with fewer skilled operators.

This shift requires dough production systems to evolve from static installations into adaptive, automated, and data-driven platforms. The following domains illustrate how market requirements translate into concrete technological solutions.

Implications for Dough Processing Technology

Demand for diverse, high value baked goods drives technical upgrades in dough rooms

Market Trends	Technical Requirements	Industry Examples
 Rise of Sourdough Formats Longer fermentation, flavour consistency	Controlled fermentation systems 	German baking group standardized sourdough / pre-dough systems across plants, ensuring target fermentation curves
 Ingredient Complexity Microdosing, allergens & inclusions	Precision dosing of powders, liquids, & inclusions 	Pizza producer in Southern Europe cut flour waste by 17% in 3 months by tightening dry ingredient dosing
 Hygiene & Allergen Control Diverse recipe agromation	CIP systems & hygienic design 	North American bakery producing nut-free and almond doughs added full CIP cycles to avoid allergen cross-contamination
 Product Line Diversity Filled pastries, brioche, plant-based doughs	Flexible recipe automation & rapid changeovers 	UK pastry facility switches between brioche, filled pastries, & vegan doughs in under 5 minutes with recipe-based microdosing
 Climate Pressure Ingredient cooling & temperature control	Ingredient cooling & temperature control 	Middle Eastern bakery installed glycol-based cooling for flour & water , achieving $\pm 0.5^{\circ}\text{C}$ dough consistency despite ambient heat

Precision Dosing of Powders, Liquids, Micros, and Inclusions

Ingredient variability and cost pressure have made **dosing accuracy a critical performance parameter**. Even small deviations in flour, water, oil, or inclusions can lead to substantial waste and quality inconsistency.

Industry data shows that improved dosing accuracy can reduce ingredient losses by double-digit percentages. One industrial pizza producer reported a **17% reduction in flour waste** after upgrading to a more precise automated dosing system by eliminating systematic over-dosing previously used as a safety margin.

As formulations expand to include micro-ingredients, functional blends, soaked grains, and flavour carriers, batch-level precision becomes essential, not only for cost control but also for repeatable dough behaviour downstream.

Modern ingredient handling systems therefore combine:

- automated storage and conveying systems
- gravimetric and volumetric dosing units
- automated tare correction
- pre-batching of minor ingredients
- in-line batch validation and recipe control

Ingredient storage infrastructure also plays a key role. For example, Spiromatic designs ingredient storage systems around custom-built Glassfiber Reinforced Polyester (GRP) silos, which offer improved insulation, smooth internal flow characteristics, and lower structural weight compared with stainless steel alternatives.

Together with automated dosing systems for powders, liquids, micro-ingredients, and inclusions, these solutions provide consistent hydration control, reduced ingredient giveaway, and faster changeovers across multiple product SKUs.

Automated Sourdough and Fermentation Control

The rise of sourdough and long-fermentation processes - once confined to artisan bakeries - is now firmly established at industrial scale. However, fermentation variability can create significant risks for **consistency, throughput, and food safety**.

Modern sourdough systems therefore require full control over:

- fermentation temperature
- residence time
- refresh cycles
- recipe-specific process parameters



A large European bread producer recently standardized sourdough fermentation across multiple plants using automated pre-dough systems, enabling consistent flavour profiles while reducing manual intervention.

Industrial sourdough installations typically combine fermentation vessels with integrated monitoring systems that log process data and link directly with recipe management software.

In practice, pH monitoring is often performed through manual sampling rather than inline probes. Field experience has shown that inline sensors may suffer from accuracy and reliability issues in demanding production environments. Instead, samples are taken, measured externally, and logged into the automation system for process tracking and control.

Scaling sourdough production at industrial level also requires **careful process design**. Engineering teams often conduct pilot trials using mobile sourdough test units to validate recipes, fermentation behaviour, and plant layouts before full-scale implementation.

Ingredient Cooling and Thermal Control

Thermal management has become an increasingly important lever in **dough quality and energy efficiency**. Rising ambient temperatures, higher line speeds, and more complex dough formulations make it more difficult to maintain stable dough temperatures during mixing.

Rather than compensating solely during mixing, many bakeries now **shift temperature control upstream to the ingredient stage**. Cooling flour, water, or liquid ingredients allows operators to stabilize dough behaviour before mixing begins.

An industrial bakery operating in a warmer climate implemented ingredient cooling prior to mixing and achieved more stable dough temperatures, reduced mechanical stress during mixing, and improved product consistency.

Typical thermal management solutions include:

- flour cooling spirals
- pre-chilled water metering systems
- glycol-based cooling for oils and liquid levains
- These systems help stabilize dough rheology while reducing mixing energy and improving overall process repeatability.

Hygienic Design and Cleaning-in-Place (CIP)

The growing prevalence of allergen-free, vegan, and “free-from” product lines has fundamentally changed hygiene requirements in dough production environments.

Manual cleaning and product changeovers are increasingly seen as **operational bottlenecks and potential food safety risks**. Automated hygienic design and cleaning-in-place (CIP) systems therefore play a central role in modern ingredient handling installations.

A North American bakery producing both nut-containing and nut-free dough products implemented automated cleaning cycles within its ingredient handling system, significantly **reducing downtime while improving audit readiness**.

Key hygienic design principles include:

- fully welded piping systems and silo internals
- self-draining pipework
- automated wet CIP cycles for liquid handling
- dry-CIP options for flour and powder lines
- quick-change dosing stations with allergen segregation

Additional hygienic engineering solutions - such as double-seat valves, double-jacketed fermentation vessels, and rotary spray heads - allow **validated cleaning performance while minimizing water and chemical consumption**.

Automation Flexibility and Integrated Control

SKU proliferation – the rapid growth in product variants – requires dough systems that can switch recipes quickly and reliably. Production environments must handle **frequent recipe changes without sacrificing consistency or throughput**.

Flexible automation architectures therefore prioritize:

- recipe-driven parameter control
- modular dosing and handling systems
- minimal mechanical intervention during changeovers

A UK bakery producing filled pastries, brioche, and vegan doughs implemented flexible micro-dosing and recipe-controlled systems that allow operators to adjust formulations on the fly without stopping the production line.

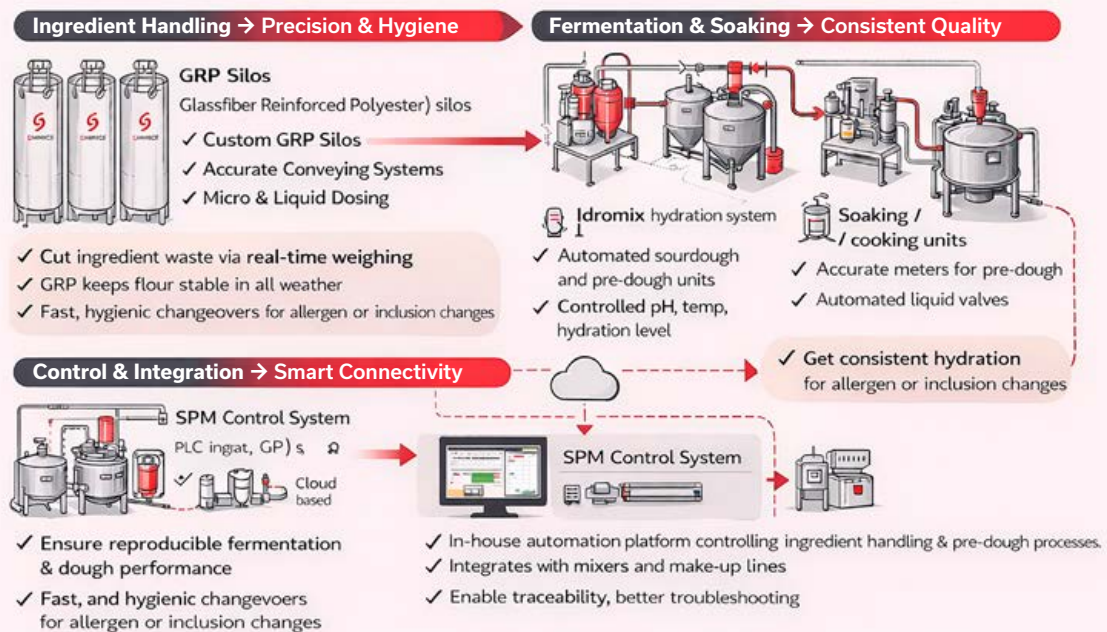
Modern ingredient handling installations increasingly rely on **integrated PLC-based control architectures**. These systems allow communication with mixers, make-up lines, and enterprise resource planning (ERP) systems.

Through real-time process monitoring and data feedback from downstream equipment, ingredient dosing and fermentation parameters can be adjusted dynamically to maintain stable dough performance.

Advanced installations also explore the use of data analytics and artificial intelligence to process the large volumes of production data generated in automated dough rooms. These tools support predictive maintenance, process optimization, and more efficient deployment of human operators.

Spiromatic's Solution Architecture

Engineering systems help industrial bakers achieve goals like consistent quality, lower waste and data-driven operations



Toward Adaptive Dough Production Systems

Taken together, these technological developments illustrate a fundamental shift in industrial baking. **Dough preparation** is no longer a static upstream utility process; it **has become a critical control point for product quality, operational efficiency, and production flexibility**.

Precision dosing, controlled fermentation, thermal management, hygienic design, and integrated automation together form the foundation of the modern dough room.

As product portfolios expand and recipes become more complex, bakeries that invest in adaptive, data-driven dough production systems will be best positioned to **scale innovation while maintaining consistent product quality**.

5. Where the Industry is Heading

The baking industry is at a crossroads, driven simultaneously by consumer preferences and operational realities. As we look ahead, several directional shifts are becoming clear:

Regional Investment Patterns Are Diverging

- **North America (USA & Canada)**

Investment momentum remains strong, particularly in private label and frozen formats. With consolidation among major brands and ongoing labor shortages, investments are being directed toward systems that increase throughput, minimize human intervention, and enable multi product flexibility.

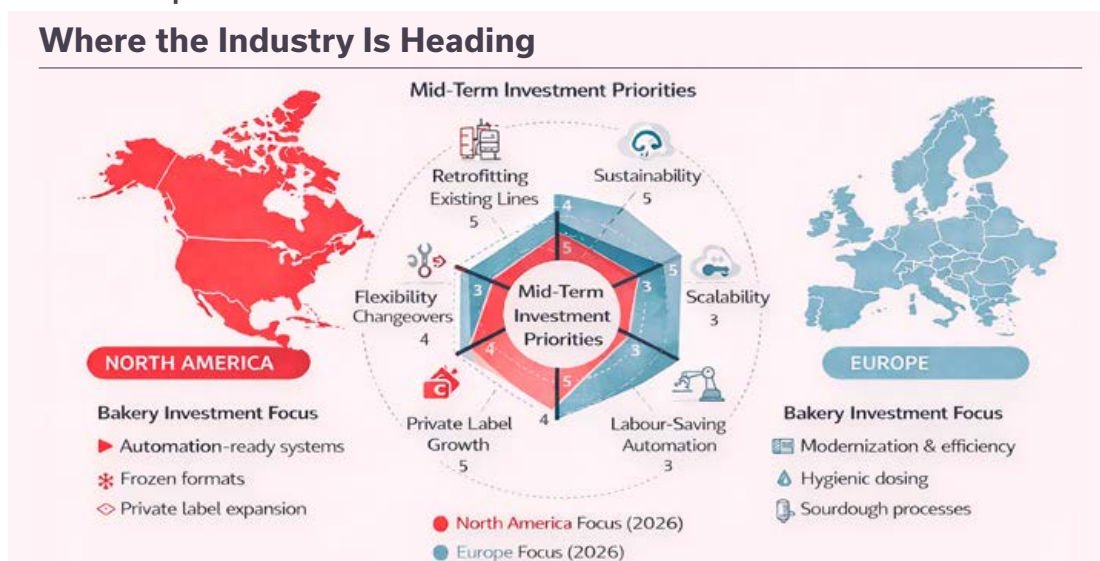
- **Europe (EU & UK)**

While growth is more tempered, replacement and efficiency investments are gaining traction. Many established bakeries are prioritizing the modernization of aging installations, especially in ingredient dosing, hygienic design, and traceability, to protect margins and comply with tightening regulatory standards.

Implication:

Suppliers must offer solutions that are both robust enough for high volume environments and flexible enough for retrofit and retrofit + expansion projects.

- **Takeaway: Whether scaling up or retrofitting, bakeries seek precision and modularity without compromise.**



- **Takeaway: Precision and modularity are key, whether scaling up or retrofitting.**

Mid Term Technological Priorities

Based on current adoption patterns and industry signals, bakeries will likely prioritize investments in the following areas over the next 2–5 years:

Priority Area	Why It Matters
Precision Ingredient Dosing	Directly impacts dough quality, reduces waste, improves cost control
Automated PreDough & Fermentation Solutions Dough & Fermentation Solutions	Delivers consistent flavor and texture across SKUs
Digital Integration & Feedback Loops	Enables proactive process control and traceability
Hygienic Design & CIP ready Systems ready Systems	Reduces downtime and allergen risk
Temperature & Thermal Management	Stabilizes dough performance in varied climates

These priorities reflect a blend of competitive pressure, talent scarcity, and regulatory standards. For example, ingredient dosing is now viewed as a **frontline quality lever** rather than a utility process, while fermentation automation is required to scale premium sourdough offerings without sacrificing consistency.

"Waste on pizza lines dropped 17% after upgrading dosing accuracy"

– Baking Business, Jan 2026

Why Bakeries Need Partners, Not Vendors

In this evolving landscape, equipment suppliers who simply sell hardware will fall behind. Bakeries increasingly demand **partners** who:

- Understand end to end process dynamics
- Can tailor systems for specific product portfolios
- Integrate closely with existing mixers and downstream lines
- Provide long term support through remote diagnostics and data services

This shift - from transactional to collaborative relationships - will define success in the next wave of bakery automation.

"It's not about adding machines. It's about aligning systems with your recipe vision and performance targets."



6. The Business Case for Dough Room Automation

While trends such as product diversification, ingredient complexity, and labor shortages are reshaping bakery production, **investment decisions ultimately depend on measurable operational impact.**

Modern ingredient handling and dough preparation systems deliver value across several key performance areas: ingredient efficiency, labor productivity, product consistency, and production flexibility.

1. Ingredient Waste Reduction

Ingredient costs represent one of the **largest operational expenses in industrial baking.** Even small dosing inaccuracies can lead to systematic overuse of flour, oils, or micro-ingredients.

Industry case studies show that improving dosing accuracy can significantly reduce ingredient losses. In one industrial pizza operation, tightening dry ingredient dosing reduced flour waste by 17% within three months.

For high-volume bakeries, this reduction can translate into substantial annual savings while also improving sustainability performance.

2. Labor Efficiency and Automation

Labor shortages remain one of the **most persistent challenges in the baking industry.** Automated ingredient handling and pre-dough systems reduce manual intervention in several ways:

- automated dosing and batching
- automated cleaning cycles
- recipe-driven production control
- remote monitoring and diagnostics

This reduces dependency on skilled operators while improving production reliability and process repeatability.

3. Product Consistency and Quality Control

Inconsistent ingredient dosing or fermentation conditions can result in **variation in dough performance downstream, affecting make-up lines, baking quality, and final product characteristics.**

Automated dough preparation systems enable:

- precise hydration control
- repeatable fermentation curves
- batch-level traceability
- integration with mixers and production lines

The result is greater product consistency across batches, shifts, and production sites. Which means less batches that need to be discarded because of quality or consistency reasons.

Less waste.

4. Flexibility for Product Innovation

SKU proliferation is one of the defining challenges of modern bakery manufacturing. Automated systems enable rapid recipe switching and flexible dosing architectures, allowing producers to adapt quickly to changing product portfolios.

Key advantages include:

- faster changeovers between recipes
- precise dosing of micro-ingredients and inclusions
- easy integration of new ingredients and formulations

This flexibility enables bakeries to **scale innovation without sacrificing operational efficiency**.

A Strategic Investments in Future Production

Taken together, these improvements translate into measurable business value: **lower ingredient losses, reduced labor dependency, improved product consistency, and greater production agility**.

For many industrial bakeries, upgrading ingredient handling and dough preparation systems is no longer simply an operational improvement — it is **a strategic investment that enables sustainable growth in an increasingly complex bakery market**.



7. Next steps

You're not alone, help to **guide you in your dough room and ingredient handling automation** is only a phone call away.

Engineering, consistent production, control, confidence.

Your bakery's ability to react to market demands - from premium sourdoughs and clean label breads to gluten free formats and fast changeovers - hinges on precision, hygiene, and integrated intelligence.

We are here to help you:

- **Modernize ingredient handling** with custom GRP silos and precision dosing
- **Scale complex fermentation processes** with automated sourdough systems
- **Achieve consistent temperature control** with advanced cooling integration
- **Reduce downtime** with hygienic design and full CIP support
- **Connect your production ecosystem** with smart automation and data feedback

Conclusion: Building Confidence in Dough-Making for the Future

The industrial baking sector is navigating a rapidly shifting landscape, with rising demands for product diversity, quality, traceability, and efficiency. From sourdough systems that deliver consistent fermentation control to allergen-safe changeovers and fully integrated automation, **the future belongs to bakeries that can adapt fast without compromising on precision or hygiene.**

About Spiromatic

Spiromatic is **a global technology partner for industrial bakeries, specializing in automated ingredient handling and dough preparation systems.** With decades of experience in the baking industry, Spiromatic designs and delivers integrated solutions for the storage, conveying, dosing, and processing of ingredients such as flour, powders, liquids, and micro-ingredients.

Our systems support bakeries worldwide in achieving greater precision, consistency, hygiene, and efficiency in their production processes. From silo storage and ingredient automation to sourdough fermentation systems and advanced process control, **Spiromatic helps producers scale innovation while maintaining full control over dough quality.**

Headquartered in Belgium and operating internationally, Spiromatic works closely with bakery manufacturers to engineer **customized solutions** that meet the evolving demands of modern baking.

Contact Us

Book a consultation or request a technical assessment: www.spiromatic.com.