

From Raw Materials to Packaging: Comprehensive Analysis of Modern biscuit Production Line

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When metal sieves tremble into snow-like flour, the assembly line orchestrates precise molecular recombination. Robotic arms carve elegant arcs in sterile chambers, weaving butter and sugar frost into nanoscale honeycomb lattices. Within tunnel ovens, temperature sensors float like sentinels, each flame recalculating differential equations for caramelization. Under thermal imaging lenses, biscuit fissures obey the destiny of fractal geometry, while AI maps probability clouds to pinpoint the critical threshold of perfect crispness. Nitrogen injectors exhale silver mist, severing oxygen's invasion with quantum-clock precision. On the ceaseless conveyor belt, lasers trace life-or-death trajectories along 0.3mm edges, transforming excess crumbs into cascading golden stardust.

From chaotic slurry spinning in centrifuges to geometric perfection vacuum-sealed in pouches, this metamorphosis consumes exactly 127 seconds. At the pipeline's end, the sealed biscuits in plastic have long forgotten their origins as wheat swaying under sunlit winds.

So, how is a seemingly simple biscuit "born" on a modern [biscuit production line](#)? The journey begins with high-quality ingredients meticulously measured and mixed in large industrial mixers, creating a dough that is both smooth and elastic. This dough is then passed through automated rollers that shape it into thin sheets, which are cut into precise shapes by rotating blades. What are the differences between traditional handmade and industrial production? Traditional methods involve artisans carefully crafting each biscuit by hand, ensuring unique textures and flavors, while industrialized production uses advanced machinery to ensure uniformity, efficiency, and scalability. And what technology ensures

each biscuit maintains a consistent crispness and aroma? State-of-the-art ovens with precise temperature controls bake the biscuits to perfection, while conveyor belts move at optimal speeds to achieve the desired texture. After baking, they pass through cooling tunnels where air circulation systems maintain their crispness. Today, we will take you into the “industrial magic world” of biscuit production and reveal the technology and craftsmanship behind it. From the initial mixing to the final packaging, every step is designed to deliver a delightful, consistently delicious treat.



Global market analysis

In the global snack food market, biscuits have always held an unshakable position. According to Statista data, the global biscuit market size exceeded \$125 billion in 2023, with a stable compound annual growth rate of over 4.5%. China, as the world's second-largest consumer market, produces more than 8 million tons of biscuits annually, making it one of the core engines driving the food industry's growth.

However, under the impact of consumption upgrade and the health eating trend, the traditional biscuit industry is facing dual challenges: on one hand, consumers' requirements for product quality are becoming increasingly stringent, shifting from 'filling snacks' to 'low sugar, low fat,' and 'gluten-free' functional needs; on the other hand, rising labor costs and energy pressures are forcing companies to seek more efficient and smarter production solutions.

In this context, the value of new type automatic biscuit machine production line for biscuits is becoming increasingly prominent. Through scientific innovation in raw material formula

precise control of production processes, and the large-scale application of fully automated equipment, biscuit manufacturing has not only achieved a leap from 'experience-driven' to 'data-driven,' but also opened up new possibilities in texture, flavor, and health attributes.



Automatic Biscuit Forming Process

DOUGH MIXING MACHINE SOFT&HARD BISCUIT SHAPING MACHINE TUNNEL OVEN SPRAYING MACHINES COOLER

Mix the ingredients

The raw material mixer combines selected wheat flour, eggs, sugar, and other ingredients in a specific proportion into a stainless steel container. The double-layered mixing paddles rotate at a specific speed to ensure uniform blending of the materials. The built-in temperature control device keeps the dough consistently at an ideal temperature of 18-22°C. After 12 minutes of standardized mixing, a smooth and soft dough is formed and automatically conveyed to the next process via a conveyor belt.

forming and machining

Hard biscuits are made by rolling the dough into sheets 5mm thick using a pasta machine. Soft biscuits are shaped with metal molds completing 200 precise punches per minute. Soft biscuits are shaped

patterned rollers that imprint three-dimensional designs on their surface. The shaping process is equipped with a visual inspection system that automatically identifies and removes damaged or deformed semi-finished products, maintaining a pass rate of over 99.2%.

baking control

A 30-meter-long smart oven is divided into three temperature zones: the preheating zone (150°C) sets the shape of the biscuits, the baking zone (200°C) triggers the Maillard reaction to produce aroma and color, and the color-fixing zone (180°C) ensures uniform appearance. The hot air circulation system maintains a temperature difference within the oven of no more than $\pm 5^{\circ}\text{C}$, with the conveyor belt speed precisely adjusted between 0.8-1.2 meters per minute to ensure consistent heating for each biscuit.

Spraying oil

After baking, the biscuits are subjected to a high-pressure oil spraying system, where edible oils are atomized into fine particles that evenly adhere to the surface. An electronic flow meter controls the oil application rate at 0.8 grams per biscuit, and some products may have additional nutrients like vitamins added. The sprayed biscuits exhibit a tempting sheen and form a moisture-resistant protective layer.

Cooling and packaging

The biscuits enter a 25-meter-long cooling tunnel and gradually decrease from 80°C to 30°C under the action of temperature-controlled fans. During the cooling process, the moisture content drops from 8% to 3%, achieving optimal crispness. At the end of the tunnel, a metal detector with a sensitivity of 0.8mm screens for foreign objects. Qualified products are then packaged by an automated packaging machine using nitrogen flush technology, completing 120 standard packages per minute.



Core ingredient analysis:wheat flour vs. tapioca starch

The flavor and texture of biscuits are determined by more than 60% of the ingredients. Among these, wheat flour and tapioca starch, as the two main base ingredients, significantly influence the product's positioning and process design due to their different chemical properties.

Wheat flour: The backbone builder of traditional biscuits

Chemical properties:

Wheat flour is made from grinding the wheat endosperm and consists mainly of starch (75%) and protein (8-15%). Its core value lies in gluten protein (Gluten), which forms a three-dimensional network when water is absorbed by gliadin and glutenin, giving dough elasticity and extensibility. Based on protein content, wheat flour can be classified into:

- High-gluten flour (protein $\geq$ 12%): Suitable for hard biscuits, requiring strong kneading.
- Low-gluten flour (protein $\leq$ 9%): Used for soft biscuits, avoiding overdevelopment of gluten.

Craftsmanship

During baking, gluten networks interact with starch:

- Shape support: Gluten denatures and solidifies between 60-80°C, forming the biscuit structure;
- Moisture control: Starch gelatinization absorbs free water, affecting crispness and shelf life;
- Maillard reaction: Proteins and reducing sugars generate caramelized flavor compounds at temperatures above 140°C.

Industry applications

Traditional hardbiscuits, such as soda crackers, rely on the extensibility of high-gluten flour, forming dense layers through rolling and folding. In contrast, softbiscuits use low-gluten flour to reduce elasticity and combine it with high fat content (20-30%) to block gluten connections, achieving a melt-in-your-mouth crispiness.

2. Cassava starch: an innovative carrier for the gluten-free revolution

Chemical properties:

Cassava starch is extracted from cassava roots and contains up to 83-88% starch, with almost no protein or fat. It has low levels of amylose (17-20%) and a gelatinization temperature (52-64°C) that is significantly lower than wheat flour (58-68°C), resulting in a more transparent and hard gel structure when cooled.

Advantages of the process:

- Increased crispiness: The small granules of cassava starch expand rapidly and burst at high temperatures, creating honeycomb-like pores;
- Low oil absorption: The gluten-free network reduces fat adsorption, allowing for a reduction in fat content by 15-20%;
- Strong stability: Wide pH tolerance range (4-10), suitable for adding acidic flavor components such as fruit acids.

Health transformation

The global gluten-free food market is expanding at an annual growth rate of 11.5% (Grand View Research, 2023), with tapioca flour becoming the preferred choice for celiac disease patients and low-carb diet enthusiasts. For instance, a certain brand has launched tapioca-based sea salt biscuits that incorporate potato protein to enhance structural strength, achieving a 90% taste resemblance to gluten-containing biscuits.



The Different Of Hard Biscuit And Soft Biscuit

Hard biscuit	The dough for this biscuit is elastic and stretchy, requires long multi-stage rolling with resting between stages.
Soft biscuit	Soft biscuits are made from crumbly and fragile short bread dough.

1. Dough Characteristics

?Hard Biscuits

The dough has high elasticity and stretchiness, similar to bread dough.

Contains more gluten development, giving it a chewy, layered texture when baked.

Requires careful gluten formation during mixing to achieve proper structure.

Often uses less fat and sugar compared to soft biscuits, focusing more on flour strength.

?Soft Biscuits (Shortbread/biscuits)

The dough is crumbly, tender, and fragile with minimal gluten development.

Contains higher fat (butter/shortening) and sugar content, which inhibits gluten formation.

Has a short, melt-in-the-mouth texture due to the high fat ratio.

More delicate to handle, as overmixing can make it tough rather than flaky.



Dough Processing Methods

?Hard Biscuits

Requires multi-stage rolling and resting to relax gluten between passes.

Typically sheeted multiple times (3-5 passes) with resting periods in between.

The dough is elastic and shrinkable, so gradual rolling prevents deformation.

Often laminated (folded) to create flaky layers (e.g., crackers, puff biscuits).

?Soft Biscuits

Mixed just until combined—overmixing makes them tough.

Usually sheet-rolled once (no lamination needed) and cut directly.

The dough is non-elastic, so it holds its shape well after cutting.

Some recipes may require chilling before forming to prevent sticking.

Baking Process Differences

?Hard Biscuits

Baked at higher temperatures (180–250°C) to create a crisp texture.

Often drier and harder, requiring precise moisture control.

May undergo multi-zone baking to ensure even crispness without burning.

?Soft Biscuits

Baked at lower temperatures (160–190°C) to retain moisture and softness.

Shorter baking time to prevent over-drying.

Some varieties (like chewy biscuits) remain slightly underbaked in the center for softness.

Final Product Texture & Applications

?Hard Biscuits

Crispy, crunchy, or layered (e.g., soda crackers, digestive biscuits).

Often used for dunking in tea/coffee due to sturdy structure.

Longer shelf life due to low moisture content.

?Soft Biscuits

Tender, crumbly, or chewy (e.g., shortbread, butter biscuits, chocolate chip biscuits).

Best enjoyed fresh; may soften over time due to higher fat content.

Popular as snack biscuits or dessert items.



Key Features

Multi-format capability: Quick changeover between product types

Hygienic design: Complies with international food safety standards

Scalable operation: Capacity can be upgraded with additional modules

Precision control: $\pm 1\%$ weight accuracy for consistent product quality

This specification sheet clearly presents your production line's capabilities while highlighting its versatility across different biscuit types and production scales. The structured format makes it easy for potential customers to understand the machine's key parameters and benefits.

FAQ

?What does after-sales service include?

A: • Basic services:

? Free installation and commissioning + operation training

? 1-year full machine warranty

• Value-added services (optional):

? Remote monitoring system (real-time fault diagnosis)

? Annual maintenance plan

? Does the equipment meet food safety certification requirements?

A: Certifications: CE, , ISO 22000 certifications.

Material Safety: All parts that come into contact with food are made of 304 stainless steel, eliminating any risk of contamination.

? How automated is the production line? Is it necessary to have a technician operate

A: • Automation level:

? The entire process from raw material input to packaging is fully automated, requiring only manual input of raw materials and random inspections.

? Touchscreen control allows for one-button start-up after parameter settings.

• Operational difficulty:

? Ordinary workers can be trained to operate within 1 to 3 days.

? We provide operation manuals in both Chinese and English along with a fault code