Data Helps Perfect Artisan Baking Techniques

Artisan Bread: Back to the Basics

Artisan bread has a hand-crafted boule- or batard-like shape, with cuts on the loaf's surface and is usually not baked in a bread pan. The iconic representation of fresh-baked bread crafted in a small bakery shop, artisan breads use manual processing techniques, and are made by people with a passion for the art of bread.

While there currently is no FDA regulation on what constitutes an artisan bread, most consumers perceive artisan products as fresher than mass-produced breads, and they are generally sourced in the fresh bakery section of the grocery store.

What makes artisan bread so special?

Here are eight common characteristics of artisan bread:

1. Lean formulation with addition of only a few flour improvers (only enzymes and/or diastatic malt).
2. Use of sourdough starters or yeast preferments for leavening and flavor.
3. Before proofing, the dough's crust is cut into different styles and decorated.
4. Dough is not placed inside a metal pan prior to baking, but baked directly on the hearth of a wood-burning, gas or peel oven.
5. Steam injection in the first 30 seconds of baking is common practice to create a glossy and crunchy crust.
6. There is a very clear difference in texture between the crust (chewy and leathery) and the crumb (moist and gummy). This combination creates a special mouth feel that aligns with customer expectations.
7. Product has an open crumb with irregular holes.
8. The loaf is aromatic with strong flavors that go from sweet, fruity and dairy, all the way to sour and roasted tones.

What's the legal definition of artisan bread?

There is no legal definition for artisan bread nor a 'Standard of Identity' for such products in the United States.

In Europe, governments have regulated the production of artisanal baked goods and have established the minimum conditions to objectively differentiate artisan-type products from regular sliced bread found in supermarkets.

Formulating Artisan Bread

Formulas for artisan bread are simple and lean. With just flour, water and yeast, any bakery can make it. Here is a example formula that is used for making a sourdough rye artisan bread:

Ingredient	Baker's %
Rye Flour	60
Wheat	40
Water	72
Salt	2.4
Yeast	0.3
Levain	30
Clean label mold inhibitors	Actual levels depend on organic acid concentration and target shelf-life
Enzymes	Actual levels depend on product type, enzyme activity and concentration

FORMULATION TIP: Unlike high-speed bread processes, artisan bread is characterized by having undergone long dough fermentations carried out by yeast preferments, prior to shaping or forming. When preferments are not used, sourdough starters are the choice for product leavening. Maltogenic amylase can be a very powerful ally to extend the freshness of the crumb to build customer satisfaction.

Processing Artisan Bread

Yeast Preferments
Sourdough
Whole Grain / Bran Pre-soaking
Grain Germination

DOUGH MIXING → BULK FERMENTATION → LOW-STRESS FORMING / FOLDING

BULK FERMENTATION → DIVIDING & SHAPING → FINAL PROOFING

SCORING / FLOUR DUSTING → BAKING → COOLING → PACKAGING

6 Critical Aspects for Artisan Bread Processing

1 **Preferment / sourdough starter development and maturation:** This is essential for optimum dough leavening and product volume as most formulas may not contain added yeast.

2 **Long dough fermentation:** Sourdough and preferments require more time than compressed or dry yeast to generate equivalent dough expansion through CO2 gas production.

3 **Gentle dough dividing and shaping:** No degassing of dough to preserve openness of gas bubble structure. This is key as product identity depends on the irregularity and openness of the crumb grain.

4 **Scoring / splitting of dough:** Some customers and bakers may agree that a nicely scored bread is the first thing people consider when artisan buying bread.

5 **Oven steaming:** Thanks to the magic of the dew point, injection of saturated steam at low pressure promotes condensation of water vapor on the dough surface. This creates unique crust thickness, gloss and texture.

6 **Baking:** Long bake times and consistent heat input are required to bring the moisture content of dough from values close to 50% all the way down to 38%. Unlike regular pan bread which requires about 10% moisture removal in the oven, artisan bread doughs have high hydration levels and, therefore, require 16 to 20% bake loss during baking. If using direct gas-fired ovens, a robust extraction system is required to remove enough CFMs of combustion gases, water vapor and hot air for a reasonable product shelf life.

THERMAL PROFILING TO REGULATE HEAT TRANSFER

Artisan, hearth-type breads primarily rely on conduction and radiation for baking. Conduction of heat from hearth to product is highly dependent on the band design (grid, mesh or solid), thermal conductivity of construction materials (metal or granite-stone) and how much dough surface is in direct contact with the oven base. These factors affect the thermal profile of artisan bread.

Thermal Events in Artisan Breads

	SOURDOUGH BREAD		PAN BREAD	
Thermal Event	**Internal Temperature (°C / °F)**	**Target % Total Bake Time**	**Internal Temperature (°C / °F)**	**Target % Total Bake Time**
Yeast Kill	56 / 132.8	Actual value depends on oven design	56 / 132.8	50
Arrival to final, constant temp.	93 / 200	85 – 90	93 / 200	82 – 85

Baking times for artisan breads baked in deck ovens generally vary from 35 to almost 50 minutes at 180°C (356°F). With other types of ovens, especially those coupled with convection or forced air, baking times can be reduced using stepped profiles and manipulation of front oven zones.

The exact values for these thermal events should be established based on product temperature, size and oven type. There is not an absolute value for how fast thermal event points should be reached during baking. It is determined by the desired product quality parameter. For artisan baking operations, thermal profiling can be used for:

- Improving crumb quality
- Reducing water activity
- Shortening cooling time
- Improving oven outputs

How does arrival affect quality?

The HIGHER the arrival value (i.e. length of time for the dough to reach final temperature):

- The **HIGHER** the moisture content of the crumb.
- The **HIGHER** the mold inhibitors or preservatives that may be required in formulation.
- The **HIGHER** the microbial instability and chances for mold growth.
- The **LONGER** the cooling time needed.
- The **GREATER** likelihood of issues at the slicers due to gummying.
- The **HIGHER** the microbial instability and chances for mold growth.

The **LOWER** the arrival value, the lower the water activity in the bread. This helps extend a mold-free shelf life. However, extremely low arrivals would cause higher staling rates and result in crumbliness.

When high moisture content and high water activity (>0.95) are common in the finished product, special packaging should be considered.

Our artisan bread made with a poolish is usually baked until we hear a hollow echo when the bread is tapped. The baking range is between 30–60 mins, depending on whether it's a deck or convection oven. Is there a way to standardize this?

The best way to standardize the baking step is with the use of thermal profiling, targeting an arrival of 85%. Once the S-Curve and typical (optimum) thermal events are established and baking conditions have been adjusted accordingly, then the product will bake consistently every day. Thermal profiling should be carried out for each type of product and each type of oven.

How can I ensure the artisan bread on my production line produces a crispy crust?

Steam injection is critical for obtaining a crispy crust. Make sure to steam dough pieces in the first 30 seconds of exposure in the first oven zone. Then, exhaust the steam by venting the oven and allowing the oven to dry out. This is critical because excess moisture in the oven would delay crisping of the crust. The best way to do this is to run an ECD BakeWATCH® M.O.L.E thermal profiler through the oven to better understand the humidity of your oven.

Why does our artisan bread mold so easily, and within three days after production?

Mold prevention relies on four fundamental concepts:

1. Proper baking (sufficient drying)
2. Using filtered air and cleaned/sanitized product-contact surfaces
3. Use of preservatives (both conventional or clean label friendly)
4. Proper packaging

Sanitize dough pumps, dough troughs, conveyor belts from cooling to packaging. Special attention must be paid to post-bake areas, such as slicing and wrapping, where personnel may come in contact with baked products with bare hands. The concept of Clean Rooms may become a valuable tool, but requires capital investment.

When using thermal profiling, make sure the Arrival point is closer to 80% if there is a mold problem. If this is achieved and the product still molds, add preservatives. Sugar reduces water activity but is not a preservative. A lower water activity means there is less water available to support microbial growth; this is why sugar-rich breads mold slower than lean breads.

Our sliced bread bakes well, but caves in at the sides while cooling. Why is this?

Caved breads could be caused by over expansion in the oven or by cooling in the pans. This is observed frequently in bakeries that have not calculated their optimal oven outputs to meet cooling line intakes, resulting in bread sitting in pans. Remove bread from the pans as soon as it comes out of the oven. If pans are not used for baking, evaluate the oxidation system and gluten levels. Reduce any ingredient that causes excessive strength and expansion in the oven.

To understand the issue of caving with data analysis, use thermal profiling to objectively measure internal crumb temperature to determine if the product is not baked adequately. Underbaking causes incomplete dough-to-crumb transition (crumb does not get as firm / rigid as expected) due to insufficient starch gelatinization and/or protein coagulation.

Why are our high-moisture content sourdough breads gumming slicing blades, even though the core temperature is down to the low / mid 30°C range?

Longer cooling, which helps remove extra water, may be helpful to correct underbaking outcomes. This is why this situation is less prevalent when the cooling process is extended. Oven targets should be used to troubleshoot this problem, as adjusting cooling time will always be a partial solution but will not correct the cause of the problem: underbaking.

To solve the underbaking situation, the bread needs to reach the Arrival point sooner. Try increasing temperature or bake time (one adjustment at a time) to move the S-Curve to the left. If this doesn't solve the problem, slowing down the packaging line, or using emulsifiers like mono- and diglycerides might help the slicing situation.

Lastly, don't forget to verify that manufacturer-approved slicer blades are being used, and that they are being changed out regularly.

My gluten-free bread gets holes under the crust. How can I minimize them?

Holes below the crust, large air pockets in the crumb, blisters near to the crust, and crust-crumb separation are often signs of early coalescence during proofing (yeasted gluten-free dough) or oven spring. Coalescence is a very common phenomenon in gluten-free baking and involves the merging of many gas cells into a single, larger (or huge) bubble due to an unstable network.

Holes can also be caused by the following:

- A weak and unstable system that is experiencing tremendous surface tension. This can be remedied by using emulsifiers like mono- and diglycerides, or lecithin. Sometimes, HPMC would work also.
- Chemical reactions happening too quickly in the baking powders used in GF batters.
- Proofing at a high temperature loosens and weakens the network, encouraging coalescence.
- Try reducing the proofing temperature to below 95°F (35°C) and decrease proofing time.
- A system that is lacking in, or inadequate emulsifiers.

Under the crust, holes are hard to diagnose and several processing conditions and formula adjustments are necessary to identify possible causes and rule out other sources. Optimum levels of hydrocolloids, emulsifiers and enzymes may greatly reduce the holes in the product.

Wrapping it all up

While most artisan bakers have a solid know-how to produce high quality bread, there are still several tools to implement that could definitely bring bakers to higher levels of competitiveness, profitability and production efficiency.

Combining the tools used by high-speed bakers and the magic touch seen in artisan bread has become the future of the breadmaking industry. While some detractors may say that a good bread can be made without the use of enzymes and/or thermal profiling to aid during baking, the truth is that once bakers have implemented such tools at the production floor, then nothing will stop them from becoming more and more efficient and sustainable.

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