Baking

TORTILLAS AND WRAPS

BAKERguide Vol. 2-3

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INTRODUCTION

Tortillas and wraps have taken over the baking industry and are becoming a staple in kitchens worldwide. Due to the low-carb trend, many restaurants are offering wrap alternatives to sandwich bread and buns. Quick-service restaurants are also increasing their wrap offerings due to its portability and convenience. Tortillas and wraps are made from a mixture of water and flour with the addition of other ingredients such as fat, salt, emulsifiers, or enzymes.

Tortillas, just like other baked goods, have health-conscious consumers looking for gluten-free, clean-label, and keto alternatives. The market size of tortillas is valued at USD 37.7 billion in 2024 with a projected growth up to USD 57.7 billion by 2032 with a CAGR of 5.45% during the 2024 - 2032 period.[1]

Tortilla Market Opportunities

- The tortilla market is constantly growing and has a current market value of **USD 37.7 billion in 2024** with a projected growth up to **USD 57.7 billion by 2032** with a **CAGR of 5.45%** during the **2024 - 2032 period.**
- Novel health trends like gluten-free, keto, and clean-label have caused the source of novel ingredient technology to satisfy consumers' demands.
- Novel current trends are surging due to the consumer's interest in healthier baked goods.

Market Research Future, https://www.marketresearchfuture.com/. Tortilla Market Size, Share, Industry Analysis, Report, 2032, www.marketresearchfuture.com/reports/tortilla-market-2419. Accessed 21 Apr. 2024.

WHAT ARE TORTILLAS AND WRAPS?

Tortillas

Tortillas are unleavened baked products made from either corn or wheat flour with added water to produce a dough that is flattened into a circular shape. They are traditionally from Latin America, especially from Mexico.[2,3]

They are used to make a wide variety of dishes ranging from tacos to quesadillas and wraps.

Types/Varieties

- **Wheat flour tortillas:** are produced from refined or patent flours and can be either yeast-leavened or chemically leavened. These tortillas have a thickness of 2–3 mm and diameters that vary from 15 to 33 cm. Most wheat tortillas are industrially produced by hot-presses or die-cut processes.[2,3]

- **Corn Tortillas:** are made with a fresh masa or “whole corn dough” following a Nixtamalization process. During this process, corn kernels are treated with an alkali like calcium hydroxide, steeped, and cooked. It is then ground, to produce masa—the Spanish word for “dough.” The fresh masa is mixed with other ingredients and sheeted to their desired dimensions.[2,3]

Nixtamalization

Nixtamalization is a traditional process used primarily in Mesoamerican cuisine to treat and enhance the nutritional value of maize (corn). This ancient technique involves soaking and cooking the corn in an alkaline solution, usually made from calcium hydroxide (lime) or wood ash, and then hulling the kernels. This process generates several nutritional benefits, improves flavor and aroma, enhances texture and consistency, and finally extends shelf life.[3]

Wraps

Wraps are a culinary dish made with a soft flatbread or tortillas rolled up around a filling. Wrap fillings vary depending on the consumer's preference, they range from animal protein fillings to vegetables, and everything in between.[2,3]

Wraps are usually made with hot-press tortillas. Hot-press tortillas are smoother in surface texture, have a higher elasticity, and light chewiness. They are also more resistant to tearing and cracking. Further explanation on the hot-press processing will be discussed later. In general, wraps are larger, more resilient, and have a longer shelf that can handle a freeze-thaw process that serves the food service industry.[2,3]

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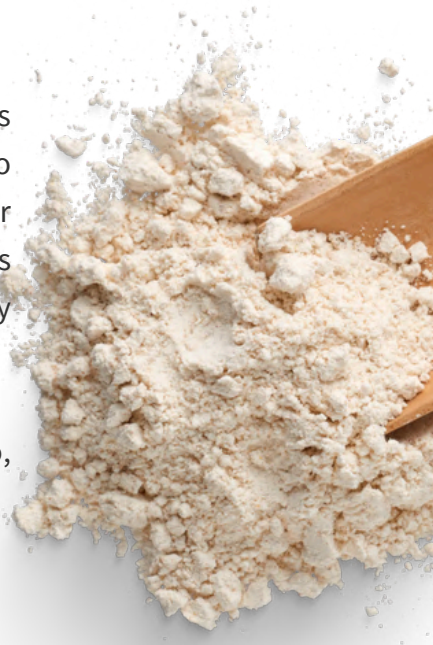
INGREDIENTS

All-purpose flour

Flour is the essential building block in the creation of tortillas, playing a pivotal role in shaping their texture, flavor, and structural integrity.



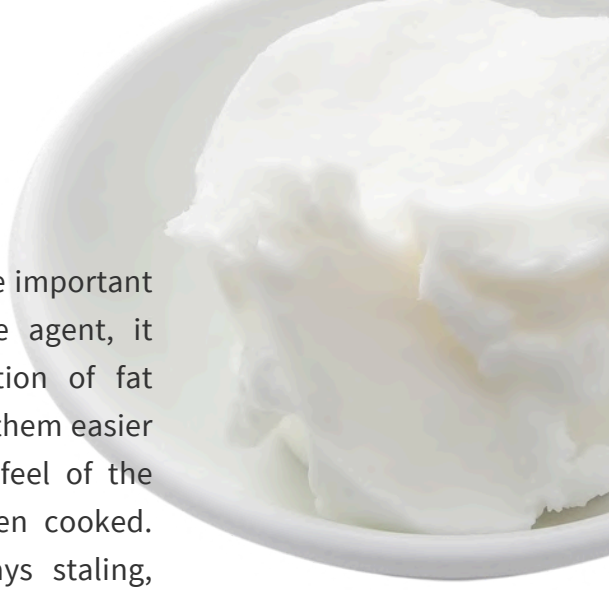
Similarly, flour serves as the key ingredient in traditional wheat-based versions of tortillas. Flour is combined with water and sometimes other ingredients to form a pliable dough that can be rolled out thinly and cooked on a hot griddle or skillet. The gluten in the flour helps to bind the dough together and gives tortillas their flexible yet sturdy structure, perfect for wrapping around savory fillings or serving as a base for tacos, burritos, or enchiladas.[2]

For gluten-free alternatives, chia flour or psyllium fiber can be used with potato, cauliflower, tapioca, rice, or sorghum flour to form a cohesive dough.[2]

Water

Water is an essential ingredient in the preparation of tortillas contributing to the hydration and elasticity of the dough, as well as playing a crucial role in its final quality attributes. Water combined with flour form a pliable and viscous dough. The hydration of the dough ensures that the tortillas remain soft and flexible, making them easy to roll out and cook on a hot surface. Without optimum water absorption, the tortillas may become dry and brittle, compromising their texture and flavor.[2]

Fat



Fat, whether in the form of oil, shortening, or lard, serves multiple important roles in the preparation of tortillas. Not only is it a release agent, it contributes to texture, flavor, and overall quality. The addition of fat contributes to the flexibility and pliability of the tortillas, making them easier to roll up without cracking. It enhances the flavor and mouthfeel of the tortillas, giving them a richer and more satisfying texture when cooked. Lastly, fat impedes starch retrogradation, and therefore delays staling, improving the shelf life of the tortilla and wrap.[2,3]

Leavening

Leavening agents, such as baking powder, bicarbonates, and other acids are frequently used for wheat flour tortilla production. They serve a vital role in the preparation of tortillas, providing a quick and convenient method of achieving leavening without the need for fermentation with yeast. [2,3]

Baking powder, which typically contains a combination of a leavening acid and a base, reacts when mixed with moisture and heat, producing carbon dioxide gas. This gas creates bubbles in the dough, resulting in a softer and lighter texture. Unlike yeast, which requires time to ferment to produce carbon dioxide, chemical leavening agents react immediately, allowing for quick and efficient preparation of tortilla dough.[2,3]

The tortilla production would determine the type of leavening agents used. Production parameters affect the leavening system's choice to obtain the tortillas' desired final characteristics from pH, opacity, dimensions, and texture.[2,3]

Slow-acting leavening acids like anhydrous sodium aluminum phosphate, sodium aluminum sulfate, and sodium acid pyrophosphate-28, used with sodium bicarbonate would produce hot-press tortillas that are more opaque, larger in diameter and thickness.[3]

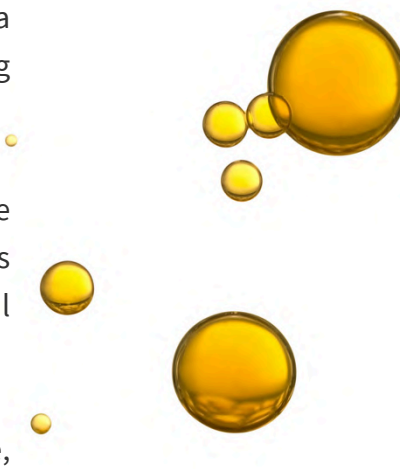
Yeast

Yeast is a biological leavening agent, responsible for the production of gas that provides the rise in baked goods.[2,3]

In tortillas, yeast is sometimes used to leaven the dough, although some traditional recipes may rely on chemical leavening agents like baking powder or baking soda. The addition of yeast helps create a light and fluffy texture in the tortillas, making them soft and pliable for wrapping around fillings or serving as a base for tacos and quesadillas. Yeast also provides a fermented aroma with a sour note.[3]

Emulsifiers

Emulsifiers play a significant role in the production of tortillas, enhancing their texture, softness, extensibility, shelf life, uniformity, and overall quality. The emulsifiers used in tortillas are:



- **Mono- and Diglycerides:** are the most commonly used emulsifiers in tortilla manufacturing. They help improve tortillas' softness and flexibility, making them easier to roll and less prone to cracking. Commonly used at 0.5 - 1.0%.[2,3]

- **Lecithin:** This natural emulsifier acts as a dough conditioner, softening the tortilla and reducing stickiness during processing. It can also enhance gas retention. It is increasingly used due to consumer preferences for natural ingredients. Commonly used at 1 - 2%.[2,3]

- **Sodium Stearoyl Lactylate:** it enhances dough stability, surface texture, dough machinability, and overall texture, contributing to the overall quality of the tortillas. Commonly used at 0.25 - 0.5%.[2,3]

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Mix reducers or relaxers

Mix reducers or relaxers are used in tortilla making to soften doughs, and improve machinability for high-speed bakeries. They are:

- **L-cysteine:** is an amino acid used as a reducing agent, it aids in gluten breakdown softening the dough. It is commonly used to improve machinability and extensibility.[4]

- **Inactivated yeast:** is a yeast that has been rendered inactive through processes such as heat treatment or pH modification. It contains glutathione, which works similarly to l-cysteine aiding in the relaxing of the dough. It is considered a clean-label alternative to l-cysteine.[5]

Enzymes

Enzymes can improve dough handling and machinability, as well as enhance mixing tolerances and crumb structure. They can also improve final product shelf-life and are considered a clean-label ingredient.[6]

The most commonly used enzymes in tortilla manufacturing are:

- **α-Amylase:** modifies damaged starch, providing a better structure and retarding starch gelatinization, improving product shelf-life. Usage depends on the nature of the amylase being utilized. Amylase is gelatinized starch-specific. Thus, it's important to consider if fungal or malt α- Amylase is the best choice. The selection of one variety over the other largely depends on the type of flour used, whether wheat or corn.[6]

- **Hemicellulose:** breaks down complex non-starch polysaccharides that retain water, influencing tortilla flexibility. Water retention is important to prevent starch gelatinization and gluten development, which can produce less flexible tortillas.[6]

- **Oxidoreductase:** oxidizes glucose molecules and produces substances that can increase the elastic properties of dough, helping stabilize the gluten network.[6]

- **Protease:** can be used in wheat flour tortillas to reduce mixing, proofing, and resting times, influencing dough relaxation.[6]

- **Asparaginases:** can aid in the reduction of acrylamide formation, a probable human carcinogen, by removing its developmental precursor.[6]

Fiber

Increased consumer concern with healthier diets has caused the need to produce tortillas with higher nutritional value. One of the alternatives to improve the nutritional quality of tortillas is by increasing the fiber content. Some of the most common reformulations for the improvement of the nutritional profile are: [7,8]

- **Whole wheat tortillas:** Whole wheat tortillas are a good source of fiber, providing around 3-4 grams per serving. They have a slightly nutty flavor and can be used in place of regular flour tortillas.[7,8]

- **Oat fiber tortillas:** Oat fiber tortillas are a low-carb, keto-friendly option that uses oat fiber to boost the fiber content without adding significant carbohydrates. They can be made with a combination of almond flour for a soft, pliable texture. Oats have several health benefits such as anti-inflammatory, antiatherogenic, and antioxidative properties.[7,8]

- **Tortillas with added fiber:** Some tortilla brands add extra fiber to their products, such as cellulose or inulin, to increase the fiber content. However, it's important to note that not all added fibers provide the same benefits as naturally occurring fiber found in whole foods.[7,8]

Acids

Acidulants are used in tortilla making to adjust pH levels to the appropriate values to improve shelf life stability and the action of some mold inhibitors.[9]

Common acids used in tortilla making are fumaric acid, citric acid, sodium aluminum sulfate (SAS), sodium acid pyrophosphate, sodium aluminum phosphate, and monocalcium phosphate. pH level can affect tortilla properties, dough with a pH of 5.5 or lower presents less elasticity and pliability. Thus, pH affects the machinability of tortilla dough, some acidulants like citric acid can cause the shrinkage of the tortillas, while others like fumaric acid cause an increase in tortilla diameter due to its reducing potential. [10]

Mold inhibitors

Mold inhibitors are ingredients that when added can aid the control or elimination of mold in tortillas.[9,10]

- **Sorbic acids and sorbates**: they are recognized anti mold agents, and are generally recognized as safe for usage in food products. The usage level of sorbate in baked goods ranges from 0.0001-0.3%, at this concentration, sorbate does not significantly impact quality. However, higher levels have been shown to affect taste and flavor. Another drawback is the negative effect on yeast, affecting its gas production, and producing sticky dough that it's difficult to process.[9,10]

- **Propionic acids and propionates**: calcium propionate is used to prevent bacterial and mold growth in food products. Usage in formulation can range from 0.003-0.3%. In contrast with sorbates, they can be directly applied to the formulation without affecting yeast activity.[9,10]

More natural alternatives:

- **Cultured Wheat**: is a fermented wheat product that contains organic acids, primarily lactic and acetic acid, which inhibit mold growth by lowering the pH. It is typically used at levels of 1% to 5% in baked goods, depending on the desired level of mold inhibition and the product's pH.[9,10]

- **Raisin Juice**: produced by fermenting various fruit or vegetable juices, contain organic acids such as acetic and lactic acid that inhibit mold growth by lowering the pH. These juices can be used at levels ranging from 1% to 3% in baked goods, with specific usage levels based on the type of raisin juice and its acid content.[9,10]

- **Rowanberry extract** contains bioactive compounds and organic acids, including sorbic acid, which have antimicrobial properties to inhibit the growth of spoilage bacteria, yeast, and mold in tortillas.[9,10]

TORTILLA PROCESSING

Tortillas can be made by the following general process:

1. **Scaling/Metering of Ingredients:** measuring and weighing flour, water, salt, fat, and other ingredients. Precision in ingredient measurement is an essential step.
2. **Mixing:** they are combined in a mixer and mixed till the dough is fully developed. The mixing process ensures that all ingredients are evenly distributed and thoroughly incorporated, resulting in a cohesive dough. Inadequate mixing to full development will result in tortillas that crack easily when rolled.
3. **Dividing and Rounding:** dough is divided into individual portions of uniform size. This step is crucial for the hot press, ensuring consistency in the size and shape of the tortillas. The divided portions of dough are then rounded into smooth, evenly-shaped balls, ready for further processing.
4. **Rest:** rest is given to the dough for a few minutes so that it can be easily sheeted or hot-pressed.
5. **Sheeting/Stretching or Hot-Pressing:** the dough is sheeted between rollers to form a continuous thin sheet of dough before it is die-cut. Alternatively, for a hot press process, the rounded dough balls are placed between heated plates and pressed This process creates the characteristic round shape of tortillas and ensures even thickness throughout.
6. **Cooking:** cut tortillas are then baked on a hot surface, such as a griddle or conveyor oven, until they are fully cooked and develop golden brown spots on the surface. Baking imparts flavor and texture to the tortillas while ensuring that they are thoroughly cooked and safe to consume.
7. **Cooling:** hot tortillas are transferred to a cooling conveyor or rack to allow them to cool to room temperature. Proper cooling prevents moisture from condensing in the package and prevents the tortillas from sticking to each other.
8. **Packaging:** stacked tortillas are packaged into bags, boxes, or other containers, ready for distribution. Packaging helps to protect the tortillas from moisture, air, mold spores, and physical damage.

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Hot-press

1

Pros: hot-press flour tortillas are smoother in surface texture, more elastic, slightly chewy, and resistant to tearing and cracking. Hot-press tortillas account for more than 90% of the retail market.[2,3]

Cons: requires a more relaxed dough, and thus may need more dough conditioners.[2,3]

Die-cut

2

Pros: tortilla dough is extruded to 0.5 – 2.5 mm and cut into individual round pieces. The die-cut method greatly reduces the cost of producing tortillas due to its high throughput.[2,3]

Cons: wraps may shrink if the dough is too elastic. The cutter may be designed to be slightly oblong to compensate for shrinkage after cutting. However, this method produces excess scrap dough that needs to be utilized efficiently or discarded. Excess waste may be produced if water absorption is not optimized for flour quality. This requires trained and skilled labor at the mixer/sheeting operator positions.[2,3]

TORTILLA FORMULATION

Wheat Flour Tortilla (Chemically Leavened)

Ingredient	Wheat Flour Tortilla (Baker's %)
Wheat flour	100.0
All-purpose shortening	6.0
Salt	1.5
Sodium stearoyl lactylate	0.5
Potassium sorbate	0.4
Sodium bicarbonate	0.6
Fumaric acid	0.24
Sodium aluminum sulfate	0.58
L-Cysteine	0.003

Table 1: Wheat Flour Tortilla (Chemically Leavened) formulation

Wheat Flour Tortilla (Yeast raised)

Ingredient	Wheat Flour Tortilla (Baker's %)
Hard/soft wheat flour blend*	100%
Water	45 - 60%
Salt	1.5-2.5
Shortening	2.0-10.0
Yeast (compressed)**	0.1-1.0
Nonfat dry milk	0.3-2.0
Soy flour (defatted)	1.0-5.0
Vital wheat gluten (VWG)	1.0-5.0
Gums	0.25
Reducing agents (Reducing agents (L-cysteine), proteases, emulsifiers (SSL, CSL, DATEM)	Varies
Calcium propionate	0.2

Table 2: Wheat Flour Tortilla (Yeast Leavened) formulation

**** All-purpose flour can be used.***
***** Baking powder can be used instead of yeast (1.5–2.0% based on flour weight).***
****** Different types and levels can be used, depending on the dough handling properties desired, machinability (rollability), and target flavor and shelf-life.***

Gluten-free Tortilla

Ingredient	Gluten-free Tortilla (Baker's %)
Rice flour	55.00
Gluten-free flour (corn or Oat flours)	20.00
Rice starch (Pregelatinised modified rice starch 70% < 125 um)	20.00
Shortening	20.00
Benexia xia powder 435W LM	11.00
Rice starch	10.00
Inulin	8.00
Salt	1.50
Yeast extract	1.00
Water at 25 °C or (77 °F)	80.00

Table 3: Gluten-free tortilla formulation with GF Benexia Xia Powder 435W LM

Corn Tortilla

Ingredient	Corn Flour Tortilla (Baker's %)
Corn meal (size-graded)*	100.0
Water	25.0-35.0
Soy flour (defatted)	1.0-10.0
Gums (CMC, pre-gel starch)	0.5-2.0%
Calcium hydroxide**	0.1-1.0%
Mold inhibitors	0.05-0.3%
Emulsifiers (lecithin, monoglycerides, SSL)	Varies
Acidulant	Varies due to pH
Vitamins and minerals (pre-mixes)	Varies

Table 4: Corn tortilla formulation

**** US 40-mesh sieve (screen size 0.016 in).***
***** Lime must be suitable for use in food and comply with local food legislation.***

QUALITY OF TORTILLAS

Achieving acceptable and consistent quality necessitates anticipating the dough's behavior during production. This anticipation is achieved through a comprehensive understanding of the recipe's ingredients and the specific manufacturing process. Utilizing a set of instrumentation equipment to study quality parameters provides the necessary information for this understanding.

Tortilla Quality Parameters

Parameter	Cause/Effect	Ideal Value	Instrumental measurement
pH	Shelf-life of the product. Higher pH tortillas tend to have a better flavor, aroma, and appearance but may compromise shelf-life.	Wheat flour: 5.2 - 6.2 Corn flour: 4.8 - 5.2	• Electrode pHmeter
Water absorption	Influences dough properties: consistency, extensibility and elasticityInfluences shelf-life of the product	Wheat Flour: 59-63%*	• Consistency: MIXOLAB 2 • Extensibility and elasticity: Alveograph
Damaged starch	Influences dough properties: consistency and stickinessInfluences shelf-life of the product	UCD <19**	• SDmatic 2
Stickiness	Water is not properly absorbed due to high levels of damaged starch and pentosans, and low levels of protein.	Damaged starch: UCD <19** Wheat Flour Protein: 7.0-10.8%	• SDmatic 2 • Protein: NIR

Table 6: Tortilla Quality Parameters and Measurement
**Rooney, Lloyd W., and Sergio O. Serna-Saldivar. Tortillas: wheat flour and corn products. Elsevier, 2015.*
***Values obtained from M. Hikmet Boyacioglu, Narasa Reddy Sunkara, Lei Zhong, and Elisa Karkle.Impact of flour type and damaged starch content on tortilla quality parameter. KPM Analytics. 2023. UCD is the international unit of damaged starch*

Parameter	Cause/Effect	Ideal Value	Instrumental measurement
Rollability	Subjective measurement that influences overall acceptability	5	The tortilla is rolled around a dowel by a trained evaluator. Subjective scale: 5 = rolls around a 1-cm dowel with no signs of cracking, 4 = slight signs of cracking, 3 = cracking and breaking beginning on the surface, 2 = cracking and breaking imminent on both sides, and 1 = unrollabable, breaks easily.
Foldability/Flexibility	• Subjective measurement that influences overall acceptability. • Objective measurement of flexibility by taking into account the quality of the protein network, amylase performance, and damaged starch level	• 0% flexibility score (ideal), 100% (all cracks) • Varies	• Percent Flexibility Score for Wheat Flour Tortillas • Protein network: Alveograph • Amylase activity: Mixolab 2 • Damaged starch: SDmatic 2

Table 6: Tortilla Quality Parameters and Measurement (Continuation)
**Rooney, Lloyd W., and Sergio O. Serna-Saldivar. Tortillas: wheat flour and corn products. Elsevier, 2015.*
***Values obtained from M. Hikmet Boyacioglu, Narasa Reddy Sunkara, Lei Zhong, and Elisa Karkle.Impact of flour type and damaged starch content on tortilla quality parameter. KPM Analytics. 2023. UCD is the international unit of damaged starch*

How Flexible is your Tortilla?

Try this test! This test consists of folding in half the tortilla three times until it reaches the shape of a slice of pie. Then, the folded tortilla is flattened. Afterward, the tortillas are unfolded, and the number of lines that show cracking on each side is counted. The flexibility score is obtained by dividing the number of lines counted by 16 and multiplying by 100. A perfect score is 0% which means it doesn't show any cracks, and a non-flexible tortilla with all the cracks possible has a score of 100%.

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Novel Quality Analysis Technologies

Tortilla and flatbread manufacturing processes are inherently more time-efficient compared to traditional bread production, primarily due to the absence of an extended proofing stage. This enables manufacturers to achieve high-volume output in significantly less time. To maintain stringent quality standards across all products, the implementation of advanced in-line vision inspection systems is essential.[13]

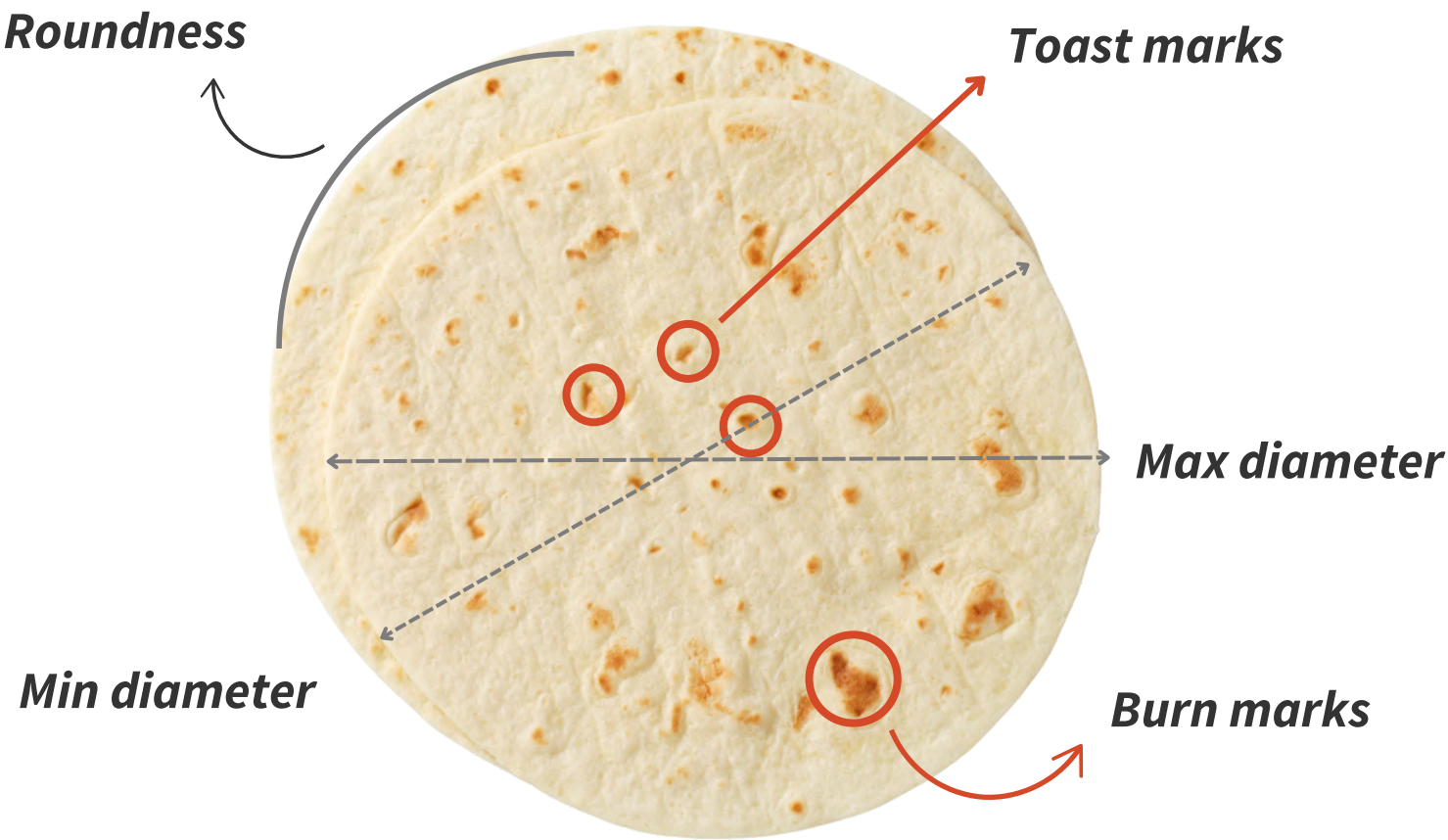
These systems continuously monitor critical quality parameters, such as the diameter, uniformity of shape, and the presence and consistency of toast marks. By leveraging cutting-edge imaging technology, manufacturers can ensure that each piece meets precise specifications, thereby enhancing product consistency and customer satisfaction.[13]

In modern tortilla production, advanced vision inspection systems play a crucial role in ensuring product quality and consistency. These systems use high-resolution cameras and sophisticated image-processing software to detect defects, measure product dimensions, and ensure uniformity in shape, size, and color. By scanning each tortilla or wrap as it moves along the production line, vision inspection systems can identify imperfections such as uneven baking or surface blemishes. This real-time quality control allows for immediate corrective actions, reducing waste and improving overall efficiency. Additionally, data collected from vision inspection systems can be analyzed to identify trends and areas for process improvement. [13]

Vision Systems Measurement and Defects Determination Capacity

Measurement Capability	Defects Detected
Diameter, roundness, area, length, width	Misshapen product. Out of Spec - e.g. too small, too big
Peak/mean height, slope, surface texture, stack height	Edge Defects - e.g. bites, dents, straight edges
Bake Color	Spots - topping color, coverage, distribution, voids
Toast Marks - Color, coverage, distribution, voids	Toast Mark Defects - too few, voids, etc

Table 7: Vision System Measurement Capabilities and Defects



TROUBLESHOOTING TORTILLAS

How can I improve the softness of my tortillas?

Using wheat protein isolate rich in gliadin increases the shelf life and softness of the tortillas. A standard tortilla usually has a specific volume of 1.4 cm3/g. Some studies show that using a 3% g wheat protein isolate can increase its specific volume to 1.60 cm3/g, making the tortilla softer.
A good quality tortilla should have a 14-day shelf life when measured with the 5-point rollability score method as mentioned above. The addition of gliadin-like proteins to tortilla flour increases the shelf life significantly.

The addition of up to 2% oil or shortening and emulsifiers like mono and diglycerides would help the rollability of tortillas. Lastly, the use of shelf-life extension enzymes like amylase would reduce starch retrogradation and improve the softness of the tortilla.

Our tortillas are great when fresh, but after a day, they crack when stretched. How can we improve its quality?

Start by using flours (milled from hard red winter wheat) developed for bread with moderate protein quality and dough strength. In addition, the use of 2% shortening may give you a softer tortilla with an increased shelf life. Depending on the makeup of the shortening used, this product may not exhibit cracking for over 20 days. Don't forget to use emulsifiers, and enzymes to help with the flexibility of the product and to inhibit starch retrogradation.

How do we prevent our tortillas from sticking to each other and tearing when our customers take them out of the package?

There are a few reasons why tortillas stick to each other after they are packaged and delivered. The biggest cause of this is inadequate cooling. If tortillas are not cooled to around 25ºC (77ºF), condensation may still occur in the package, and this enhances the adhesiveness of the individual tortillas. If you are dependent on conveyor cooling, use air jets to deliver cool air, or slow down your conveyor lines. Another way to cool down your tortilla cooling line is to make sure that the relative humidity and temperature of your plant are as low as you can make it. Last but not least, baking it longer would drive out more moisture. Since water is an insulator, less water in the final tortilla would make it cool faster.

SUMMARY

Tortillas are here to stay, and keeping up with the latest production trends is a must-have for bakers worldwide. From the basic to the most state-of-the-art quality control techniques this guide will give you a trip through the wonderful world of tortilla production.

If you need additional technical support in tortilla formulation or an improvement of your novel tortilla production efficiencies, contact us.

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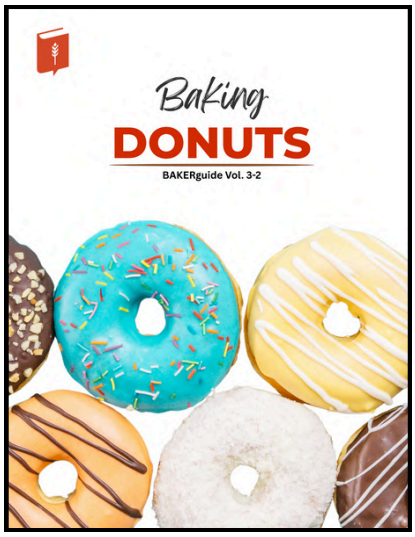

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