

All About Tortilla Chip Processing

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AGENDA

- Intro - All About Tortilla Chip Processing

- Kick off – Tortilla Chips In The market

- Overview - Masa Dough
 - Raw Corn Cleaning
 - Corn Cooking
 - Corn Soaking
 - Corn Washing
 - Corn Mill Grinding
 - Corn Masa Characteristics

- Overview - Tortilla Chips Processing
 - Sheeting & Cutting
 - Chip Toasting/Crusting
 - Chip Conditioning – Moisture Equilibration
 - Chip Frying / Cooling
 - Seasoning
 - Finished Product Quality Evaluation
 - Packaging – Weighing, Bags & Cases

- Q&A

**HAVE YOU EVER WALKED DOWN
THE CHIP AISLE AT YOUR GROCERY STORE**

**HAVE YOU EVER WONDERED
HOW MANY DIFFERENT
TORTILLA CHIPS THERE ARE?**

**NOT THE TORTILLA CHIP
AISLE AGAIN!!!**



**WHICH ONES DO WE
BUY???**

Number of Tortilla Chip Brands in the U.S.

There is no single definitive count of all tortilla chip brands in the U.S., because the number depends on how you define “brand” — whether you mean distinct company names, product lines, or individual product SKUs.

Why The Numbers Differ

- **19 brands** = distinct company names with active tortilla chip products in the marketplace.
- **185 companies** = all manufacturers producing tortilla chips, including private labels and niche producers.
- **741 products** = all individual tortilla chip SKUs (base chip ingredients, flavors, sizes, packaging) from those companies. *This broader count includes every product variation (base chip ingredient, flavors, shapes, packaging) from each company, so the number of unique brands is lower than the total product count.*

Facts and Information were obtained from internet web search

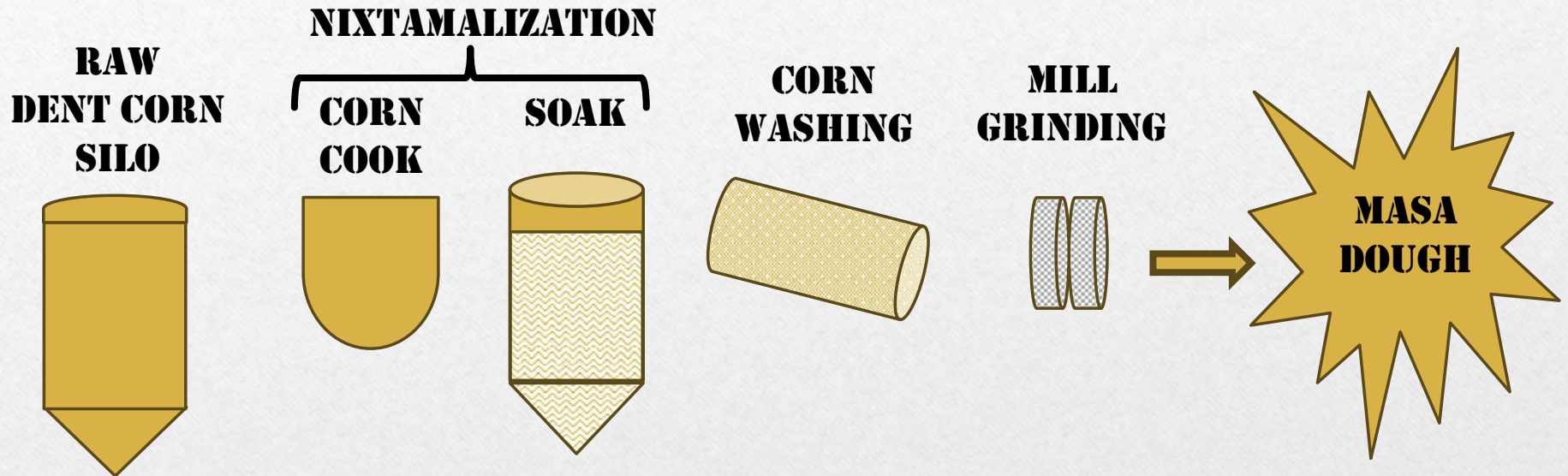
There are many Tortilla Chips in the market.

And at the end of the day, they all must be processed.

There maybe some minor recipe modifications based on differences in shapes, sizes, ingredients, recipe, flavors and packaging.

Today we will be going though the “Intro” of the more traditional corn Tortilla Chip Processing.

OVERVIEW - HOW WE GET MASA



RAW CORN CLEANING

Corn from the supplier is unloaded from a truck or rail car into a Bulk Silo.

Corn from the Bulk Silo being transferred to Corn/Grain cleaner.

The Cleaner removes debris such as cob, dirt, rocks, etc.

Incoming Raw Corn Approximate

Moisture = 14.0 -15.0 %

Intrinsic Oil = 3.0 – 5.0%



CORN COOKING

Corn is then transferred to the cook kettle.

The “recipe” will include the amount of Corn, Water and Lime (Calcium Hydroxide) for the batch.

The lime addition helps loosen the hull and allows moisture to penetrate the kernel.

After the corn, water and lime are added, heat in the kettle begins to rise until it reaches 200F.

This is when the actual cook time begins.

Hypothetical Recipe:

Corn - 1000 lbs

Water - 3000 lbs (360 gal)

Lime 15 lbs

Temp= 200F

Time= TBD



CORN SOAKING

Before transferring to the soak tank, quench water is added to the kettle to stop the cook of the corn. The target temp for transfer to soak tank is 125F.

Soak time begins when all corn enters the tank.

Typical soak tank will hold two cook kettles of corn.

Full Soak Time: =/> 10 hours

Target: 12 hours.

Corn Moisture Content Approximately at Soak Completion 45%



CORN WASHING

After soak, corn is transferred over to the corn washer hopper, that feeds corn to the corn wash tumbler. As the corn transfers, it travels over a filtering screen to remove as much pericarp or husk that can from the soak tank as it enters the retention hopper. Corn transfers from the tumbler onto a drain belt to drain as much surface water. The tumbler has a series of high-pressure spray nozzles that clean the slime and pericarp from the corn that fall through the holes in the tumbler drum to a drain. At point on the drain belt, you should be able to slide your hand into the bed of corn and remove it without any build up. The term “Squeaky Clean” has been used for the description of how clean the corn comes out of the tumbler.



CORN MILL GRINDING

Clean washed corn is fed into the mill for grinding into masa. As the corn enters the mill, water is added simultaneously. The amount of water is adjusted based on the masa moisture test result. The grinding stones gap setting is critical to the particle size of the masa. This is a variable of sheeter performance, chip cutting, blister formation and the finished product texture.

Masa Temperature is also important for good sheeting performance.

Masa Moisture Range: 49% – 52%



Masa Temp Range: 90F – 100F

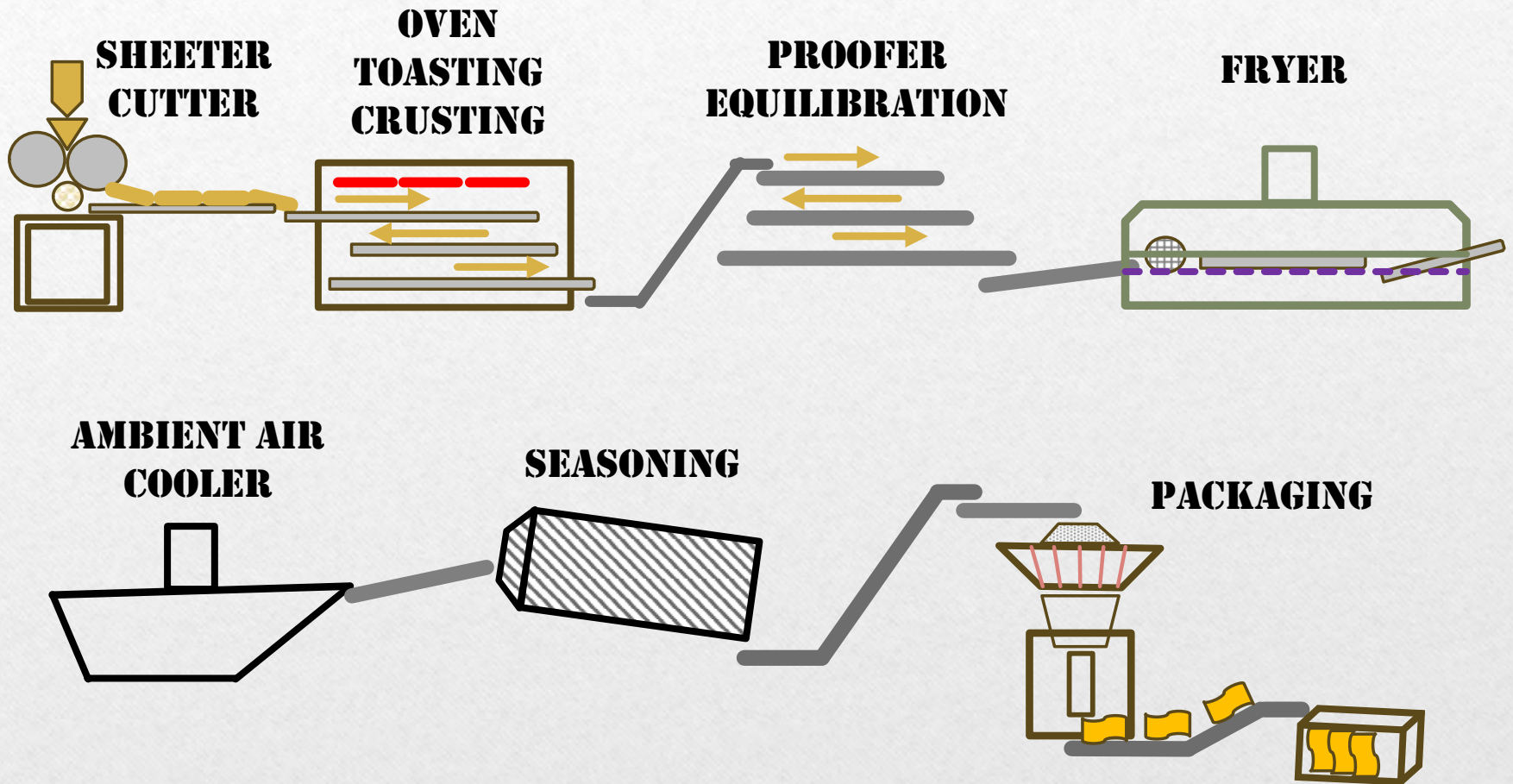


CORN MASA CHARACTERISTICS

You can learn a lot from a masa sample just by the feel. You can learn to correlate the masa moisture test results to the masa feels. The same with the grind and feel correlates to the stone gap setting. Rubbing out some of the masa in the palm of your hand helps evaluate the particle size.



OVERVIEW - HOW WE GET TORTILLA CHIPS



SHEETING & CUTTING

Sheeting is for the right thickness for your chips. Chip thickness is a factor of texture and processing downstream. There are adjustments on each side that moves the rear roller in and out. Consistent masa feed to the sheeter will prevent variability in sheet thickness.

The front roller speed of the sheeter dictates the throughput rate as it drives the revolutions of the cutter. As chips are cut; a wire releases the chips onto the sheeter belt. The wire is held in place by bands in grooves on the roller and returns the excess masa after cut.

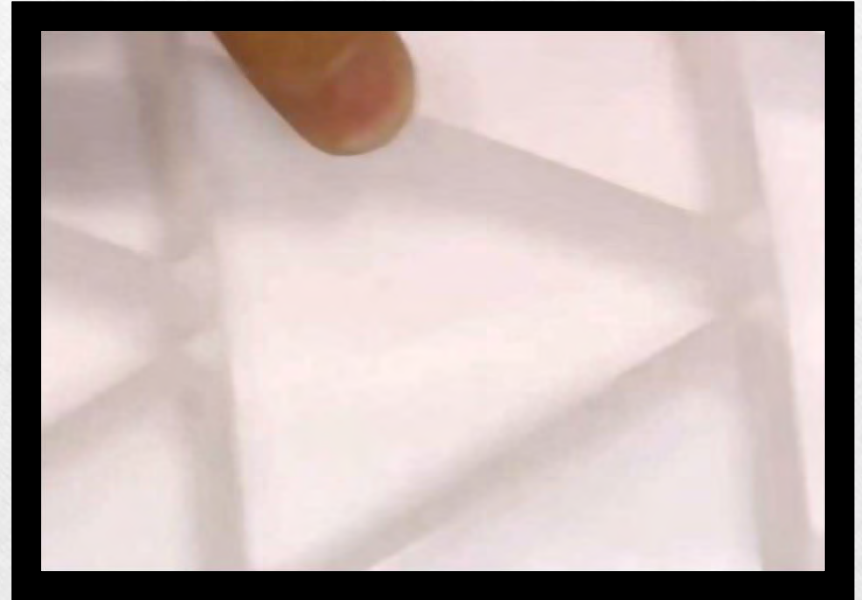
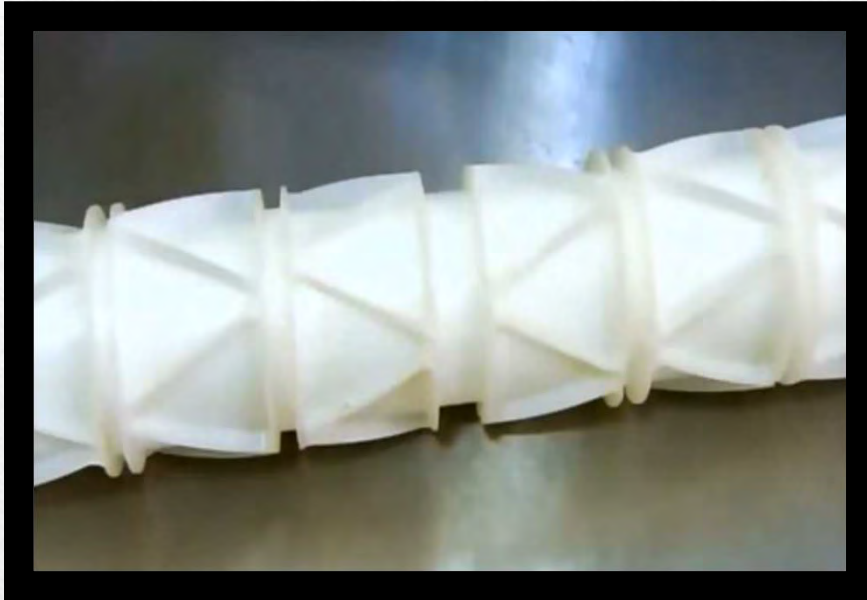
Chip weights off the sheeter belt on each side will determine if adjustments are needed to the sheeter gap.



CUTTER DETAILED

Cutters are machined out of Food Grade Plastic. The cutter product rows spacing will match the front roller spacing. Maximizing the cutting area in design makes the sheeting operation more efficient with minimal masa return.

Inspection of the die cups on the cutter is need to ensure the edges are not damaged and provide clean edge cuts that can result in defects and product waste.



OVEN

TOASTING - CRUSTING

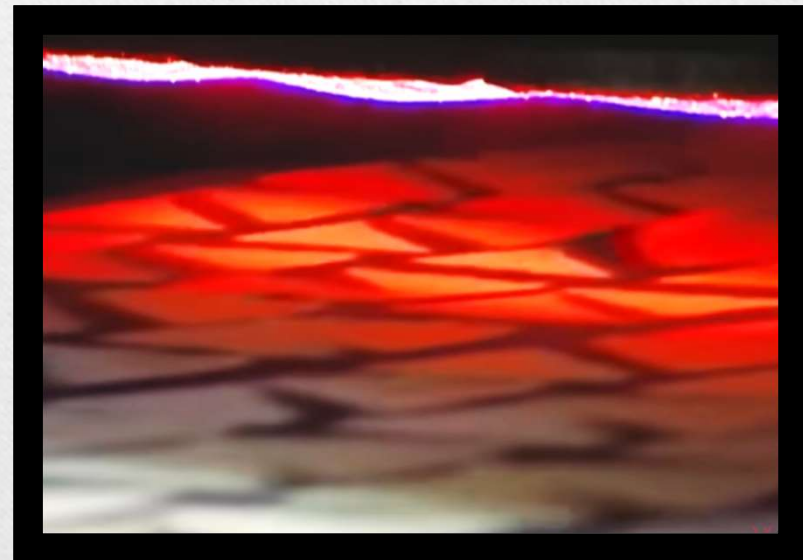
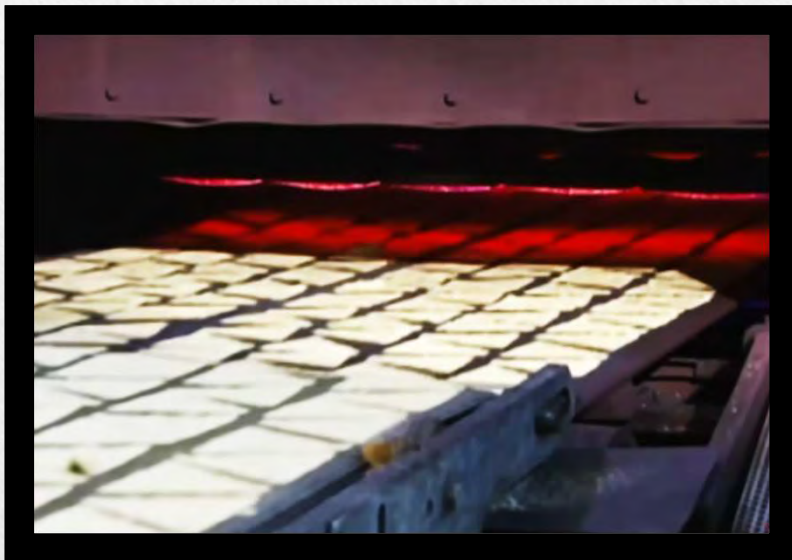
Sheeted cut chips enter the 3-tier oven where the crusting of the chips begins with optimum belt temperature and high intensity infrared burner heat. Product continues to the second and third oven tiers.

Dwell time is a variable of the product achieving the target crusted chip moisture and blister formation.

Each product will have different oven profiles based on the characteristics for that product design.

Oven Belt Temp Ranges: 610F – 725F

Oven Dwell Time Range: 16-18 Sec *(for this product design)*



OVEN DISCHARGE TOASTING - CRUSTING

Product Crusting can be evaluated left center and right side, as it discharges the oven. You can also take samples and conduct moisture analysis to see how consistent the moistures are side to side.

You can grab a chip and see blister pockets that have formed.

Since the moisture has not yet equilibrated, you are able to check the crust on both sides and the amount of moisture in the center by sliding the chip surfaces in between your thumb and index finger.

Toasted Chip Moisture Target: 36% (+/- 2%)
(depending on the product design)



PROOFING - EQUILIBRATION

The Proofer is directly after the oven discharge and is a 3-tier conveyor used for open air moisture equilibration. The product is transferred onto the top tier targeting minimal amount of product overlap.

As product transfers to the second tier, the belt speeds slightly increase to create separation on each tier.

In the photos below, the belts are a bit overloaded and not optimum. More product separation would provide for better product quality.

Proofer Dwell Time Range: 2 min – 4 min



FRYING

After moisture equilibration, the chips are then be transferred into the fryer. The feed rate into the fryer is so that chips have some separation and not clumped together. Fryer oil quality monitoring is critical for your overall product quality and shelf-life stability.

Free Fatty Acids Target <.30 (*good oil filtration is critical*)
Fryer Temperature 350F-370F **Dwell Time 50-60 seconds**
Oil Content 23.5 – 25.5% **Moisture 1.00 - 1.30%**



FRIED TORTILLA CHIPS TO AMBIENT AIR COOLER

As product discharges from the fryer, it transfers onto an Ambient Air Cooler (AAC). The AAC belt speed, fan speed and dwell time, control cooling for the target range for product at the tumbler infeed.

Product Temperature Range at Tumbler Infeed: 155F – 170F



SEASONING

Product is transferred to the tumbler after or during cooling.

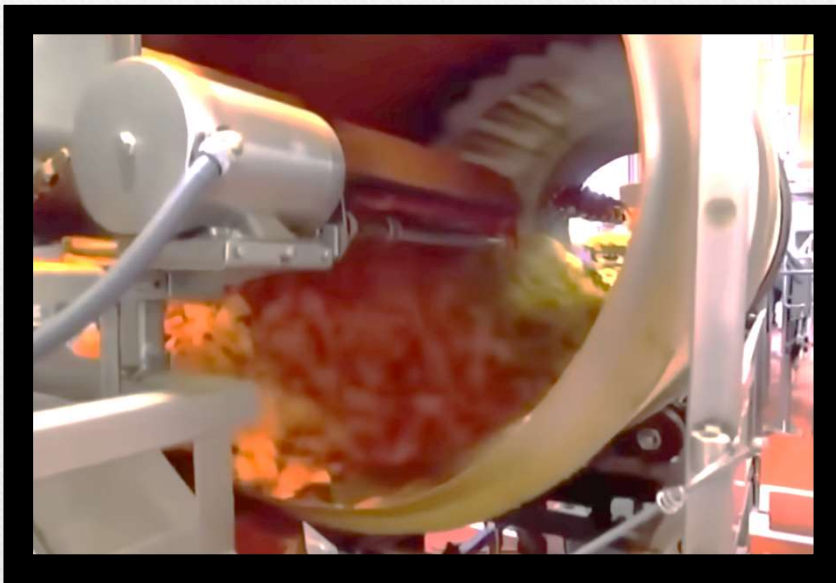
Target Temp at Tumbler Infeed: 150F-170F (*not to exceed 175F*)

The product is typically sprayed with oil as an adhesion property for the seasoning powder.

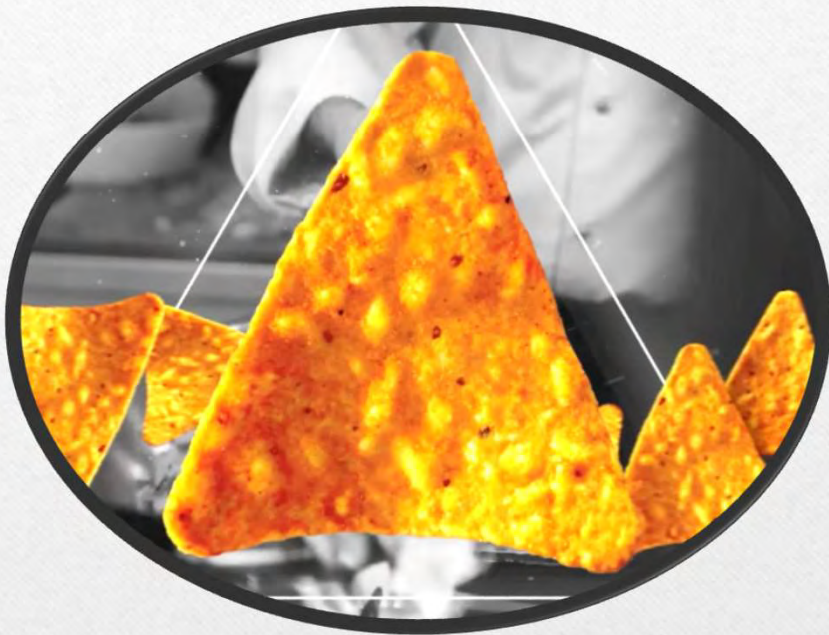
Product temperature too low or too high creates seasoning falloff.

Too hot of temp can change flavor profile of the seasoning.

Seasoning Management is critical for product quality and efficiency.



FINISHED PRODUCT QUALITY EVALUATION



Good Manufacturing Quality Practice is to evaluate your finished product on a given frequency.

Typical quality evaluation may include the following attributes:

Appearance- Evaluate the overall chip for size, thickness, product edges, blisters, seasoning coverage, oil soaks, color, etc.

Flavor- Evaluate the base chip and seasoned chip. Base chip for the corn flavor, oil flavor/content, toasted corn, seasoning or salt intensity, etc.

Texture- The bite and chew feel. Factors that drive texture are masa grind, grittiness, chip size, thickness, blisters, moisture, etc.

PACKAGING – MULTI-HEAD WEIGHER

The Multi-Head Weigher is programmed and set-up to the product being produced and bag size being made in the bag maker below the weigher. Depending on the bag size, will determine the weight of product per bucket that is needed to fill the bag size per the spec weight



PACKAGING - TORTILLA CHIPS IN BAG

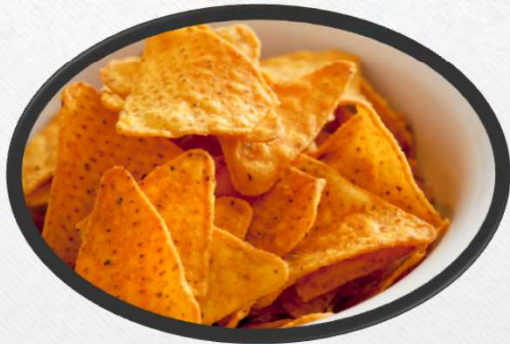
Bag makers are programmed and set-up per the bag size and film. This is critical to the performance and efficiency of the bag maker output. Once the product is fully packaged, bags are inspected for bag appearance, registration and alignment, wrinkled seals, overall bag weights and seal integrity for air leaks. All these factors are related to the bag maker set up.



PACKAGING - CASE PACKING

Finished packaged bags are carefully collected and packed into the appropriate case size. They are then placed on pallets and shrink wrapped for the warehouse and as they await loading onto a truck.





Q&A



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