



Total Quality- Material and Process Control



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- Total Quality Management (TQM)
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Total Quality Management

Definition- Management approach to long term success through customer satisfaction.

Total quality management (TQM) is the continual process of detecting and reducing or eliminating defects in manufacturing, streamlining supply chain management, improving the customer experience, and ensuring that employees are up to speed with training.

Total quality management aims to hold all parties involved in the production process accountable for the overall quality of the final product or service.



TQM in Masa Industry



Incoming corn



Fresh Masa



Dry Masa



Products
Table tortillas, chips,
taco

Corn quality

Process centered; Decision making based on facts

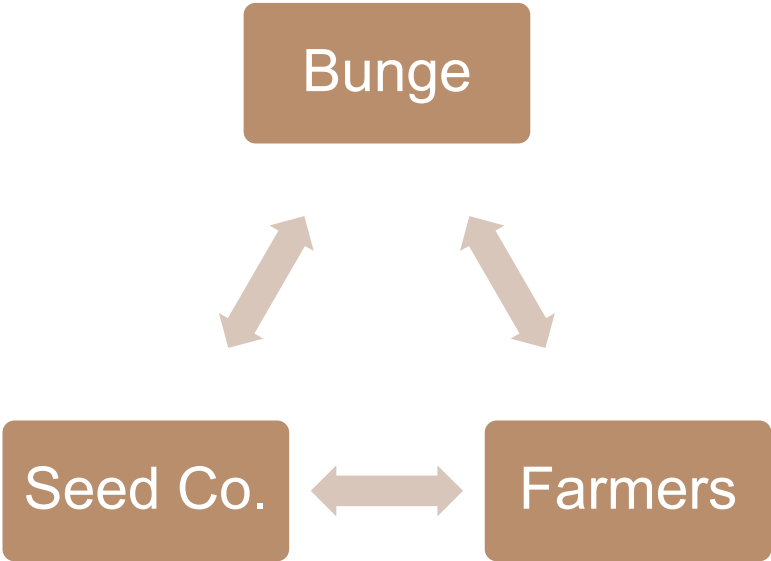
TRAITS WITH THE HIGHEST SIGNIFICANCE:

- Test Weight (lb./bu.) (Bulk Density)
 - Test weight is the most critical trait for determining the grade of corn. This measurement is closely related with the true density of corn. Its value is affected by the condition of the grain, its texture, and its protein content
- True Density (g/cm³)
- Kernel Size (5/16")
- Kernel Hardness
- Damaged kernel (%) (insect damaged, heat, broken, cracked, etc.)
- Moisture content (%)
- Foreign or extraneous material (%)
- Mycotoxin content (ppm or ppb)

Corn Hybrid Selection- Continuous improvement



*“Delivers
Consistency”*



SEED ANALYSIS & SELECTION

Seed companies send hybrid samples to our Grain Quality Lab in St. Charles, MO.



The samples are analyzed for the following traits:

Test Weight

Density

Kernel Size

Kernel
Hardness

CENTERFIELD BENEFITS



UNIFORMITY OF
GRAIN QUALITY



SUPPLY CHAIN
TRANSPARENCY



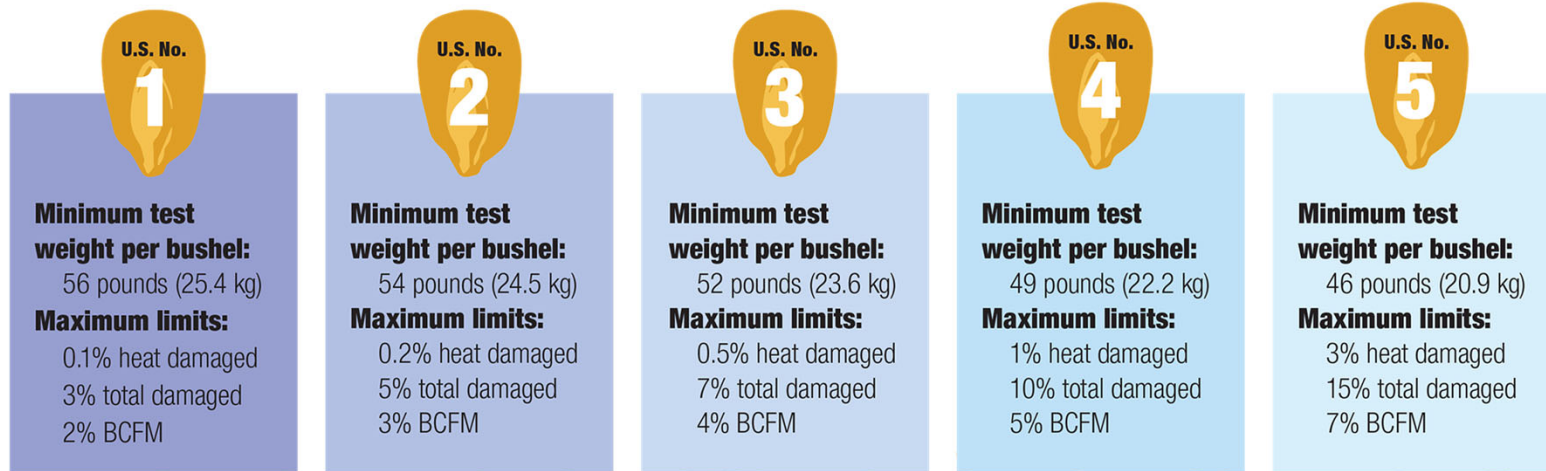
TRACEABILITY



SUSTAINABLE
AGRICULTURE

USDA Corn Quality Grades

The U.S. has a reliable and transparent quality grading system.



■ **Buyers should contract** quality requirements and non-grade factors.

■ **Final corn quality** is also impacted by movement through export marketing channels.



U.S. GRAINS
COUNCIL
www.grains.org

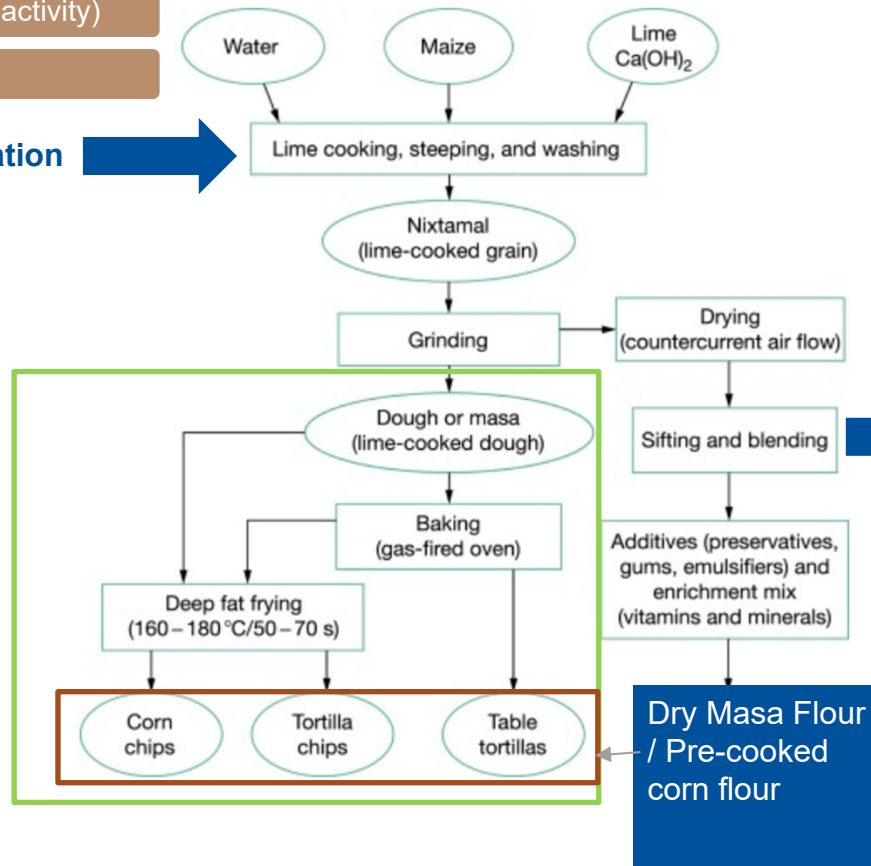
Corn Masa Process

Heat (Time and Temperature correlation)

Chemical Agents (Solubility, reactivity)

Friction (Mechanical force)

The Gelatinization starts here



Fresh Masa Process

Particle Size Distribution Control / sifter screens .

BungeMaxx lecithin's benefits in Wheat flour tortillas

Our lecithin brings it all together



Processing efficiency

- Facilitates mixing of ingredients
- Promotes flour hydration
- Less wear and tear on production equipment.



Dough conditioning

- Aids gluten formation
- Uniform dough balls
- Fewer doubles
- Increased sheetability
- Reduced tearing



Enhanced appearance

- Improved extensibility
- Produce tortillas that are 5% larger in diameter
- Consistent tortilla shape



Shelf life

- Retain the fresh-like characteristics of tortillas
- Delivers excellent opacity
- Improved elasticity

Contact our lecithin experts: beu.specialtylecithins@bunge.com

Analytical Tools in Masa Industry

- Moisture Content
- Particle size distribution
- Tri-stimulus color (L a b)
- Bostwick (Consistency)
- Masa Yield
- pH
- Pasting properties of Dough
- Texture analysis of Dough, tortillas and chips/ shells



Color

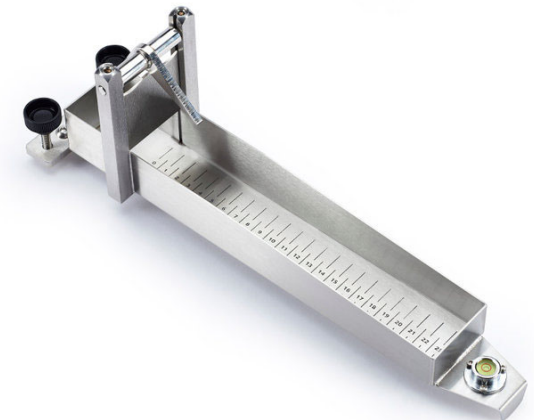
- The color of masa flour is a result of many factors throughout the production process. Retailers and consumers have high expectations for the appearance of tortillas and lime cooked snacks. It is important to control for these factors to produce the optimal quality product.
- **INCOMING CORN**
 - The color of the kernels and the cob determine the color the flour. Tan cobs are ideal for cleanest, brightest color. It is important to prevent cross contamination between batches of yellow or white corn.
- **PROCESSING**
 - The amount of lime used during the cooking process affects the color. The higher the pH of the flour, higher the intensity of the color. Additionally, the more the nixtamal is washed, the whiter the product will be due to removal of lime, germ and pericarp.
- **ADDITIVES**
 - Bleaching agents can be added to lighten the color of the flour or finished products. The most common is titanium dioxide. This is a water insoluble food coloring additives using at a maximum of 1% concentration.

Measuring degree of cook

- Overcooking of masa flour can cause the dough to be sticky while undercooking masa can cause the dough to lack cohesiveness/machinability.
- The degree of lime cooking of corn is perhaps the most important factor for masa flour production. This can be measured by the following methods of analysis:
 - Extent of pericarp removal
 - Dry matter losses
 - Enzyme susceptible starch
 - Birefringence
 - Viscosity with consistometers
 - Amylograph peak viscosity
 - Mixograph
 - Texture analyzers
 - RVA- Pasting properties

Bostwick

- Travel distance determined by Viscosity of an over hydrated flour slurry.
- Factors affecting Bostwick-
 - Degree of cook
 - Granulation
- Higher the degree of cook, higher is the water binding capacity and lower is the bostwick value
- Finer granulation absorbs more water and gives lower bostwick value



Yield

Is an indirect measure of the Water Absorption Capacity. (lb water / lb flour) expressed in lb of dough for 1 lb of flour.

It's **subjectively** measures the amount of water absorbed by the flour during masa preparation; **depending on the starch gelatinization level, water binding capabilities of other polymers (fibers, proteins) and the particle sizes.**

The **penetrometer** measure the force required to deform masa obtained after hydration with a given amount of water gives an indication of amount of cooking or starch gelatinization.

In the Yield method the force is the targeted firmness which means that we must add enough water during mixing of the flour to achieve the targeted value.

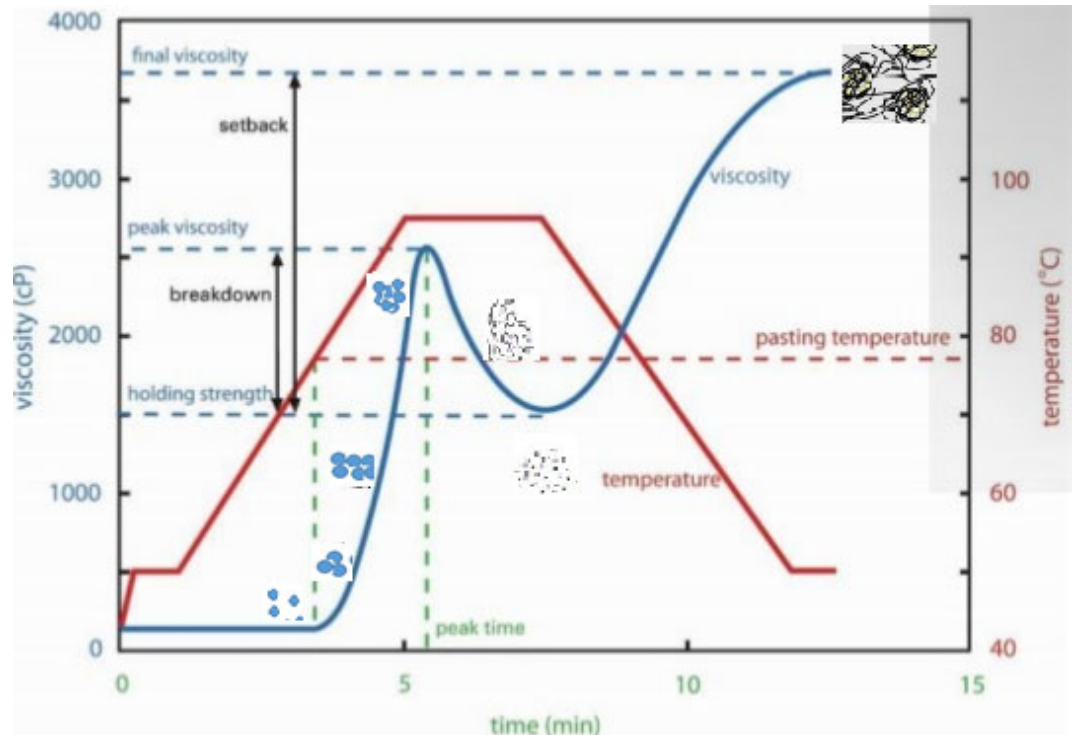


pH

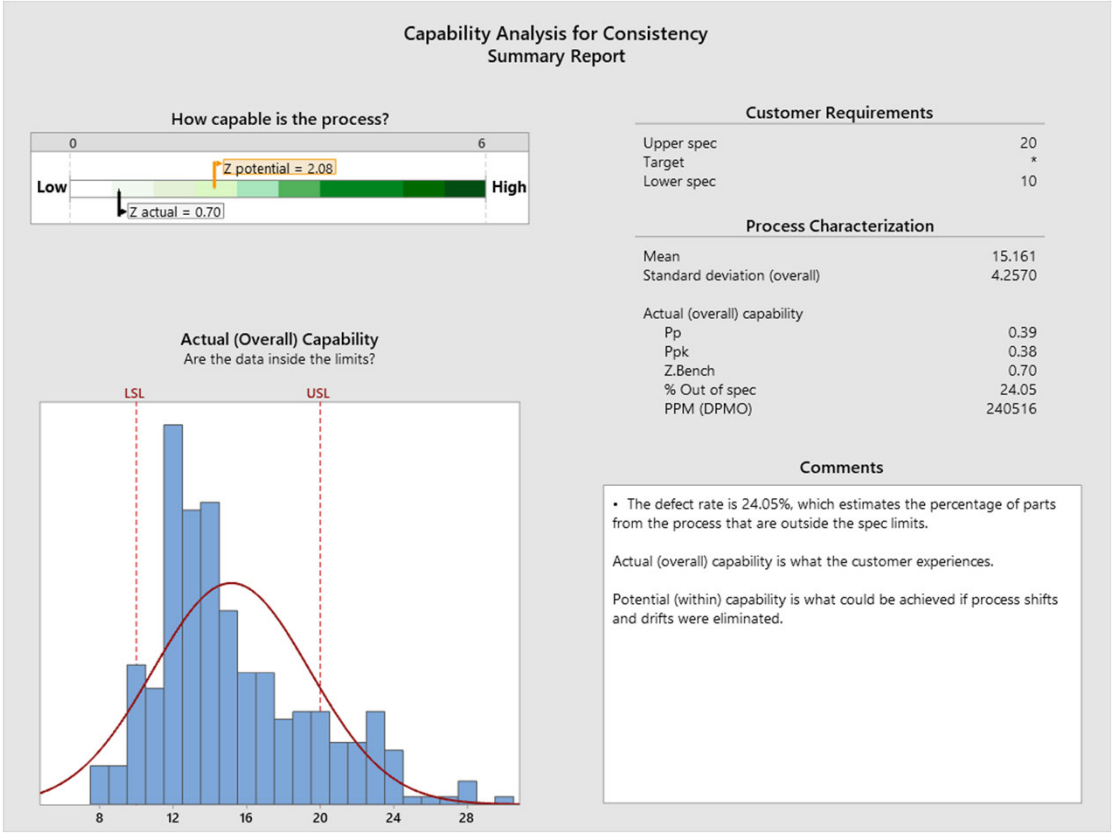
- pH is a very significant factor affecting the shelf life of tortillas. It can be controlled with the addition of organic acids or using different concentrations of lime when cooking.
- pH range for table tortillas:
 - 4.8 – 5.2
- pH range for tortillas for frying:
 - 5.2– 5.5
- PH for high lime table tortillas
 - 10-10.5

Pasting properties

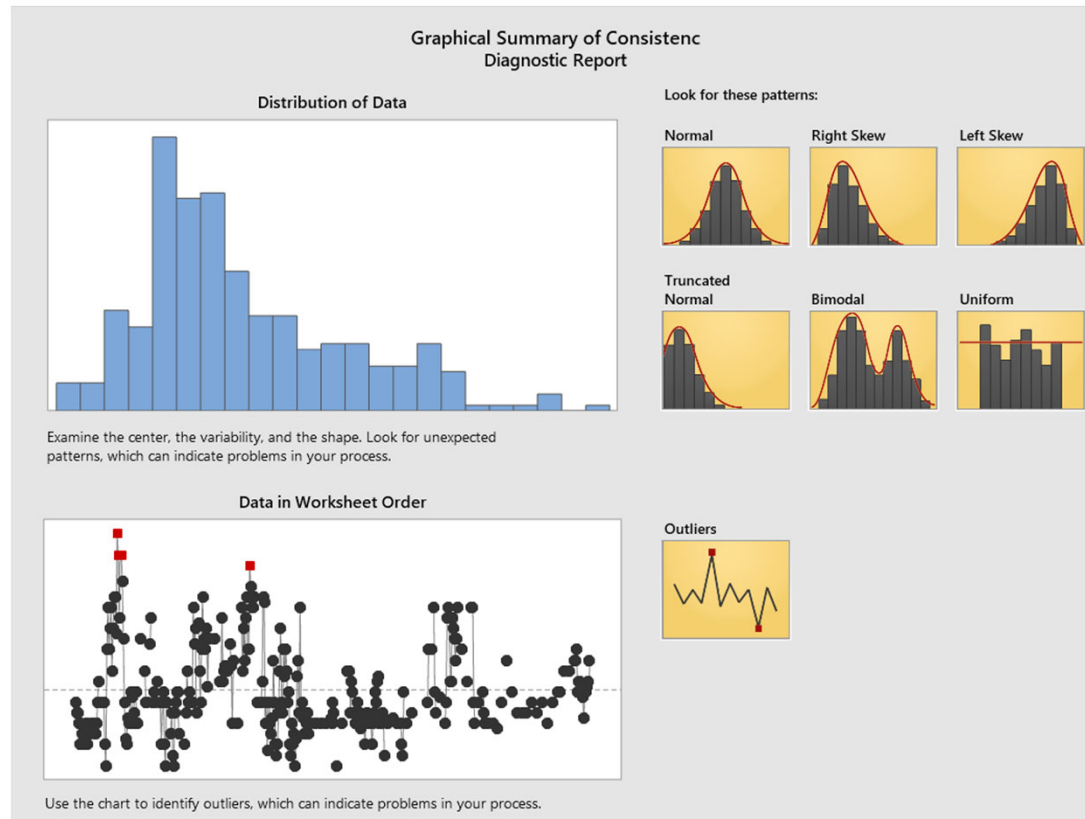
- RVA can help understanding starch changes during processing
- Uncooked starch does not contribute viscosity since the starch granules are intact
- During the heating ramp, the starch granules swells, the viscosity starts to built up
- During the cooking, the starch granules are broken, the smaller micelles from starch are dispersed and dextrinized, the viscosity starts to reduce from “peak”
- During the cooling, the cooked micelles start to entangle with each other and form the gel, the viscosity start to increase.



Data: Documentation, Analysis and Control



Concept of Variability





Thank You!

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