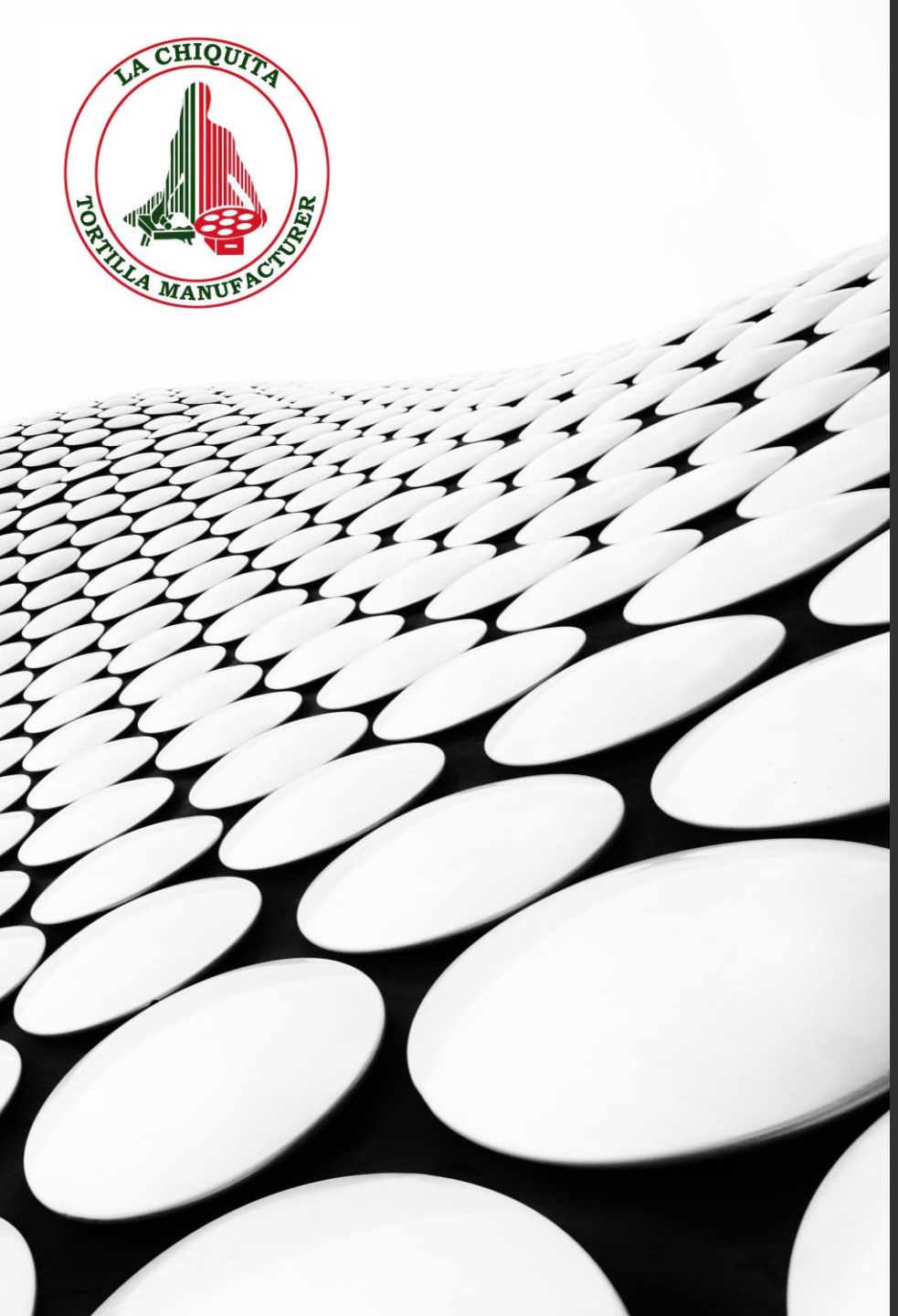

TROUBLESHOOTING FLOUR TORTILLAS

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La Chiquita Tortilla

Las Vegas Convention Center

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2019 TECHNICAL CONFERENCE

Troubleshooting Definition

- **Troubleshooting** *noun* [U]
- **US**
  - **the process of solving problems, esp. complicated problems in a system:**

- **Troubleshooting** *noun* [U]
- **UK**
  - **discovering why something does not work effectively and making suggestions about how to improve it**

Critical Areas to Troubleshoot

1. Ingredients
2. Formulation
3. Process
4. Equipment
5. Sanitation

Critical Areas to Troubleshoot

- **Ingredients**
  - FLOUR
    - Stability is more important than protein
    - MTI – Mixing Tolerance Index = best guide for flour quality and mix time, indicates quantity of reducing agents required
    - 10-30 = > reducing agents (30 ppm cysteine / sulfites) or 0.5% inactive dry yeast
    - 30-50 = ~ 10 ppm cysteine / sulfites 0.25% inactive dry yeast
    - > 50 = add Vital Wheat Gluten, possible add reducing agents

Understanding a Farinograph

Mixer: 300 g Speed: 63 1/min
Consistency 504 FU with waterabsorption 57.0 %

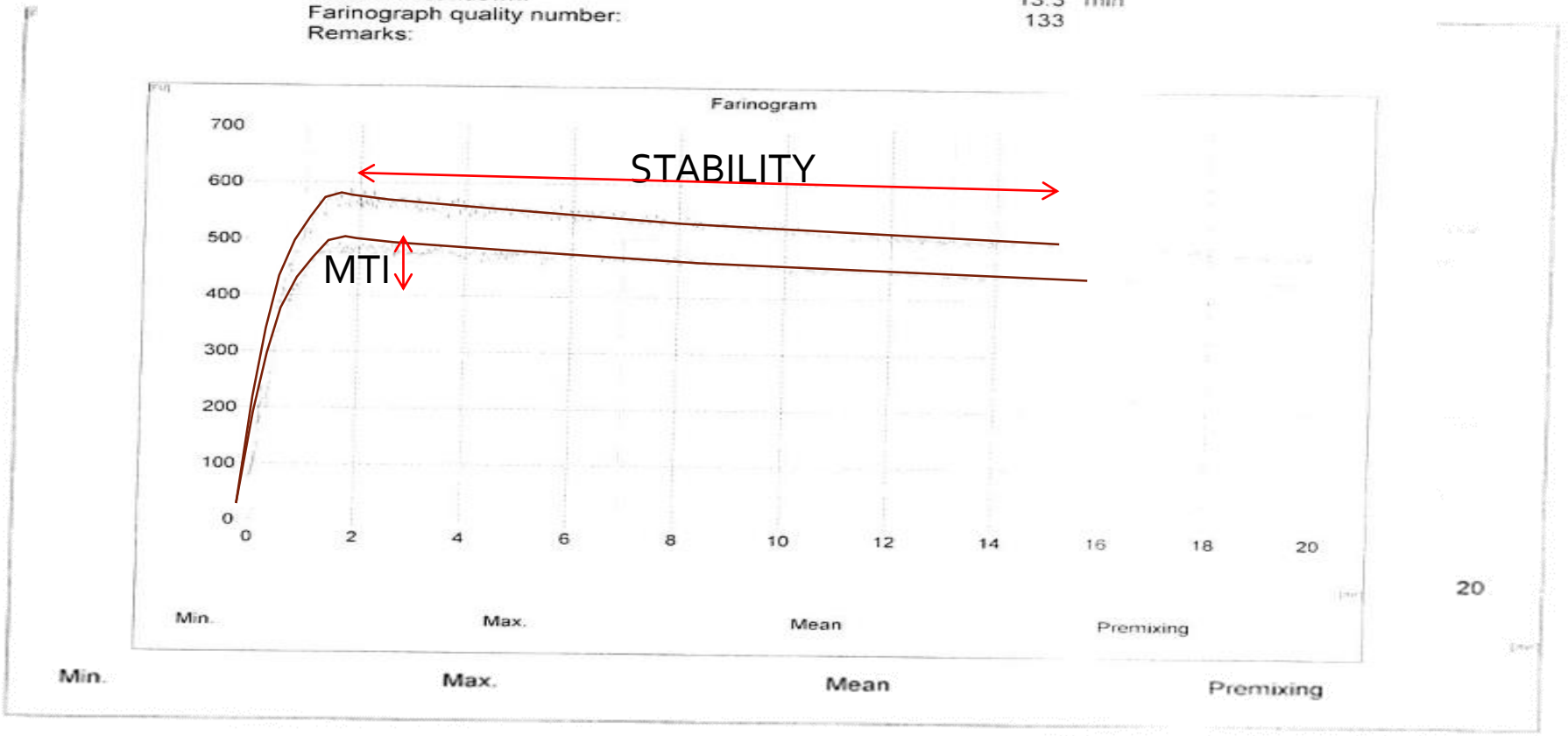
Moisture content: 13.5 %

Waterabsorption (corrected for 500 FU): 57.1 %
Waterabsorption (corrected to 14.0 %):

Mixer: 300 g Speed: 63 1/min
Consistency 504 FU with waterabsorption 57.0 %

Moisture content: 13.5 %

Waterabsorption (corrected for 500 FU):	57.1 %
Waterabsorption (corrected to 14.0 %):	56.5 %
Development time:	7.0 min
Stability:	12.2 min
Toleranceindex (MTI):	24 FU
Time to breakdown:	13.3 min
Farinograph quality number:	133
Remarks:	



Chopin

How does the Chopin Alveograph work?

What the graph means

W = baking strength of dough (the area under the curve)

L = extensibility of dough (time taken for bubble to burst)

P/L = dough strength and extensibility (ratio of curve height to length)

High W = strong flour

P = maximum pressure required

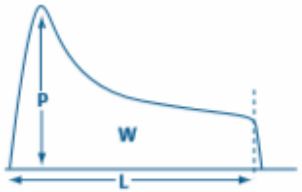
Low P/L = very extensible and low strength

Typical characteristics of different wheat varieties

nabim Group 1

Suitable for bread flour – makes strong elastic dough and has excellent bread-making potential.

- high pressure (P)
- long time (L) to burst



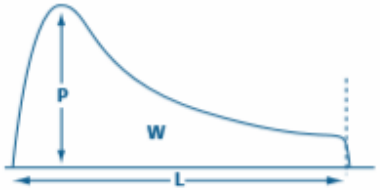
Typical range

Alveograph P/L	0.5 - 0.9
Alveograph W	>200

nabim Group 2

Suitable for bread and baking flours – most varieties having bread-making potential.

- low P/L ratio important



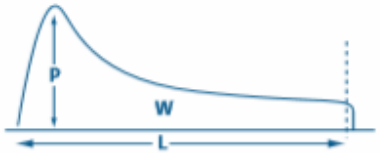
Typical range

Alveograph P/L	0.4 - 0.9
Alveograph W	170 - 310

nabim Group 3

Suitable for biscuit and blending flours – makes extensible dough, good for biscuits and blending with strong wheats.

- low pressure (P)
- long time (L)
- area under the curve (W) less critical



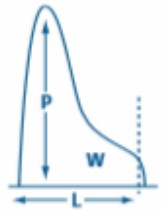
Typical range

Alveograph P/L	0.2 - 0.4
Alveograph W	70 - 100

nabim Group 4

Suitable for animal feed only – makes tough, inelastic dough

- high pressure (P)
- short time (L) to burst



Typical range

Alveograph P/L	0.3 - 1.5
Alveograph W	60 - 140

Five stages of the Alveograph test take place over three days

Stage 1
Wheat conditioned to standard moisture

Stage 2
Wheat milled and left to rest

Stage 3 & 4
Dough produced and formed into a disc

Stage 5
Air is pumped into dough to test resistance and elasticity

Chopin Alveograph showing stage 5 - air being pumped into dough

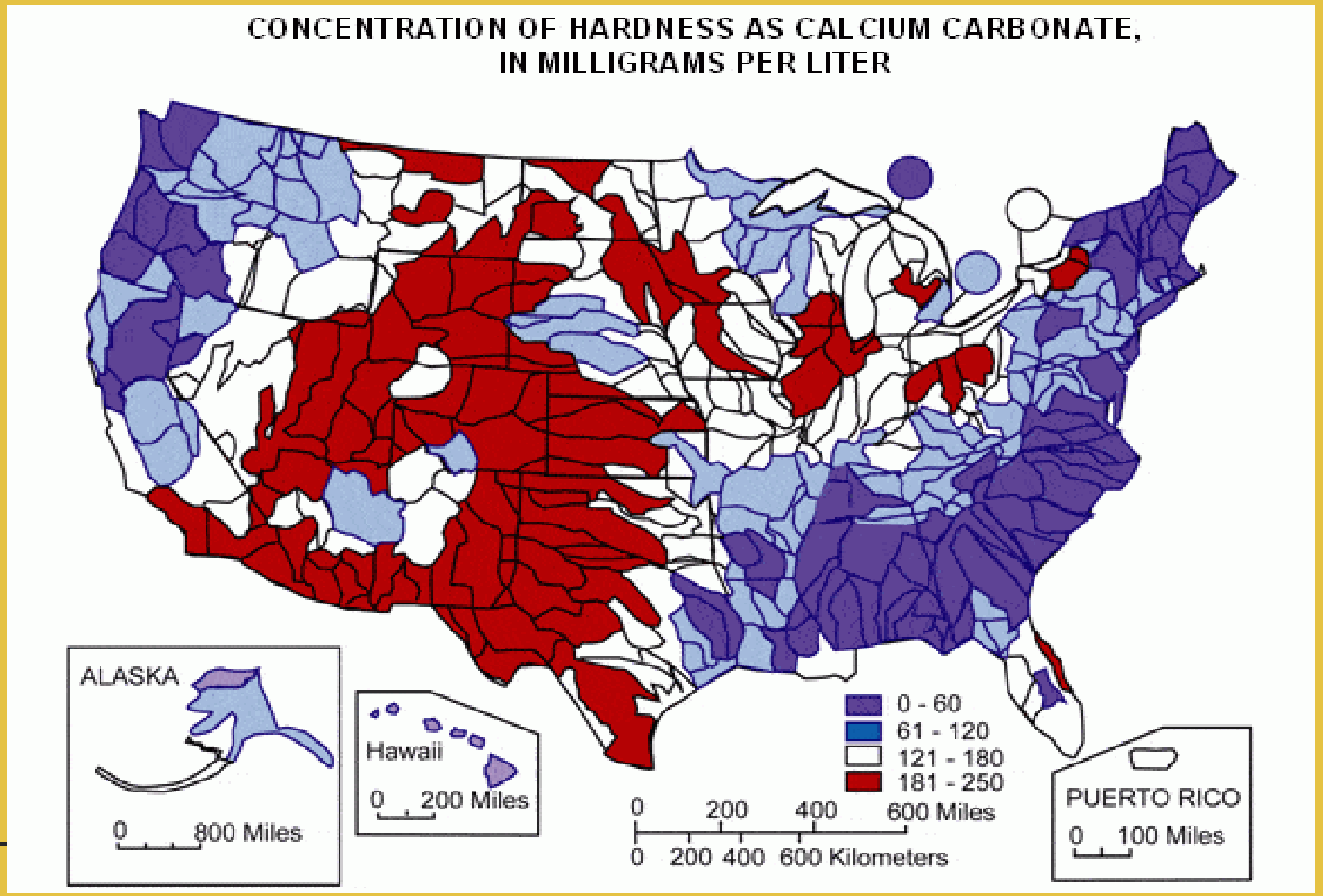
British Cereal Exports is the Export Promotion Department of the Home-Grown Cereals Authority

HGCA

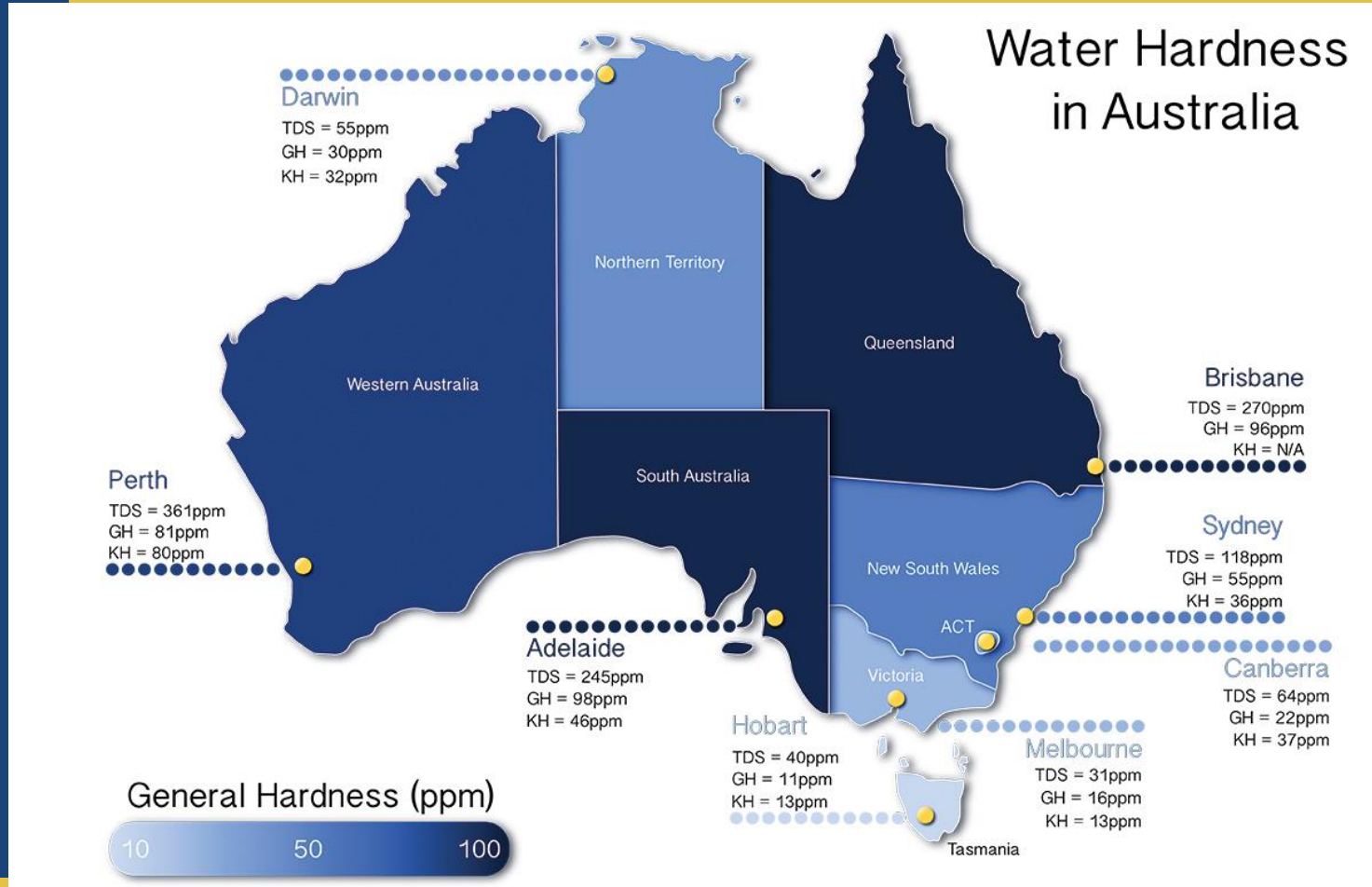
Critical Areas to Troubleshoot

- WATER
- Water Hardness
  - Measured in Parts per Million
  - < 100 ppm = Soft Dough
    - Cut or remove reducing agents
  - Between 120 ppm – 200 ppm = Soft but Elastic Dough – ideal for tortillas
  - > 250 ppm Very Elastic
    - Add more reducing agents
    - Increase mix time
    - Reduce salt

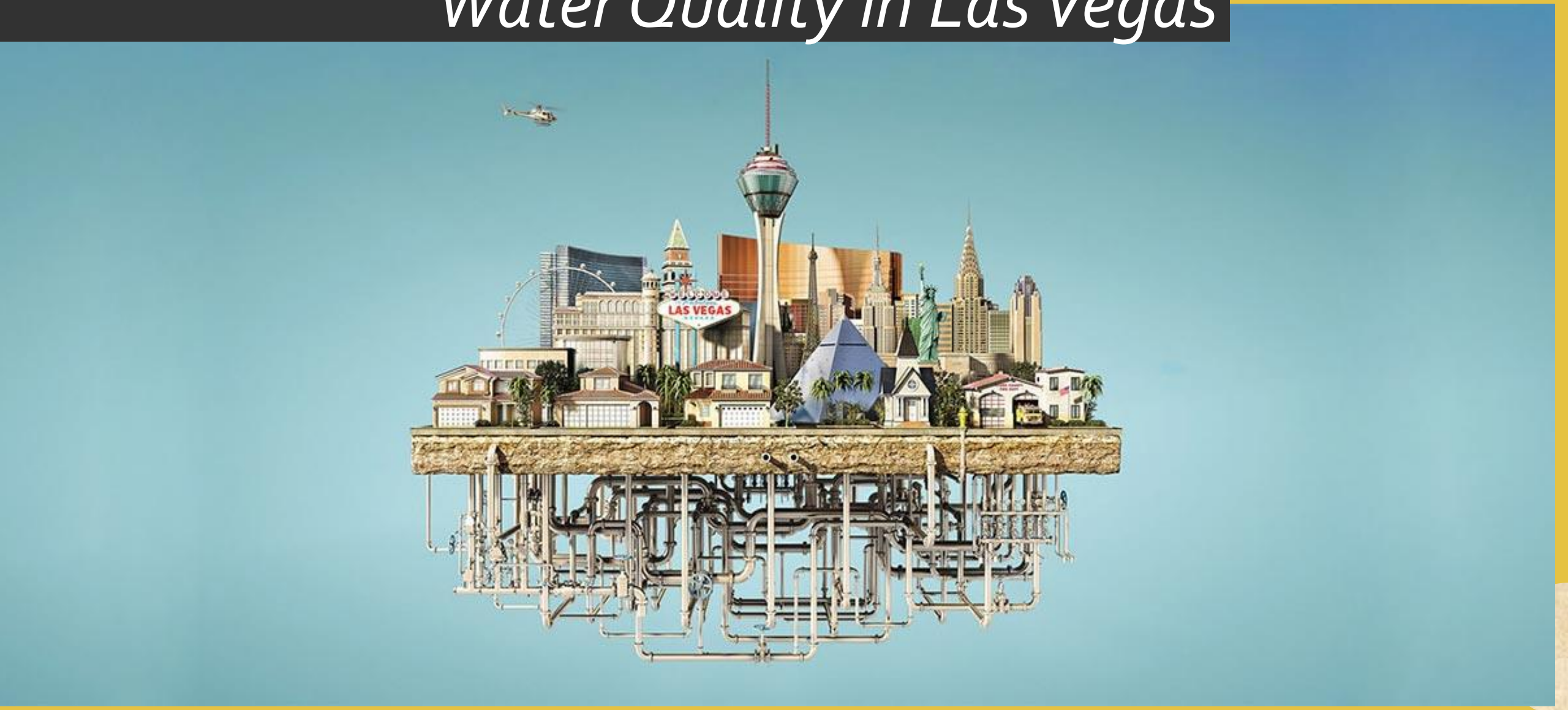
Water Hardness US



Water Hardness Other Regions

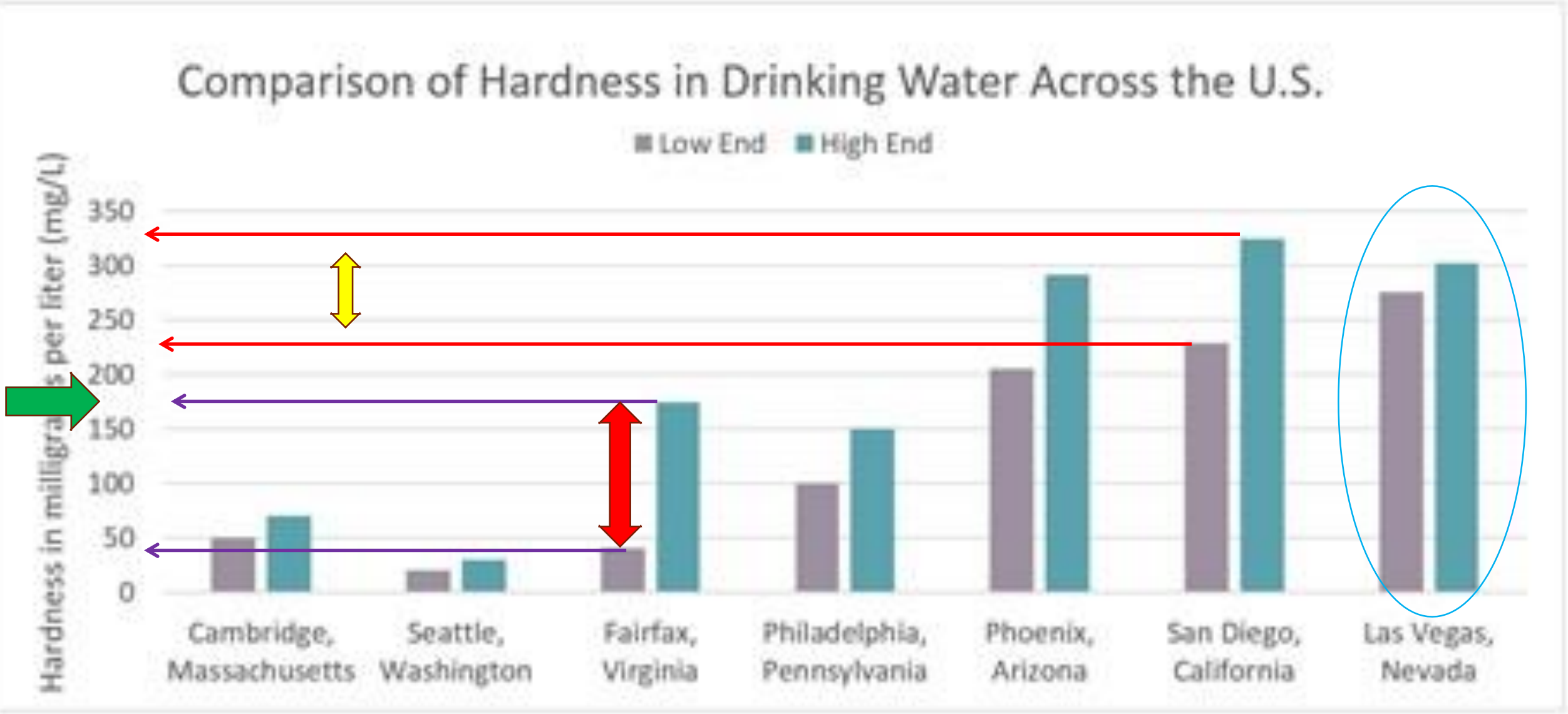


Water Quality in Las Vegas



Las Vegas Valley Water District https://www.lvvwd.com/about/water-district/index.html

Hardness US Regions



Formulation

- Traditional – US, Mexico
  - Water 50% of Flour
  - Shortening 10% of Flour
  - Salt 2 – 2.5% of Flour
- Europe
  - Water 35 - 40% of Flour
  - Shortening / Oil 4 – 10% of Flour
  - Glycerin 5 – 10% of Flour
  - Salt 1 – 1.5% of Flour

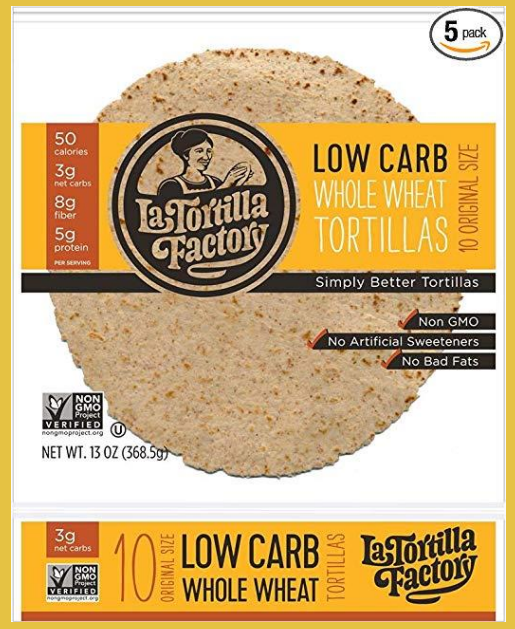
Formulation Shortening vs Oil

- **Flour** 100
- **Water** 50
- **Shortening** 10
- **Salt** 2
- **Baking Powder**
  - **Translucent** 1-2
  - **Fluffy** 2-4
- **Emulsifier** 0.5
- ***Preservatives*** *1*
- ***Fumaric acid*** *0.5*

- **Flour** 100
- **Water** 55
- **OIL** 3
- **Salt** 1.5
- **Baking Powder**
  - **Translucent** 1-2
  - **Fluffy** 2-4
- **Emulsifier** 1-2
- ***Preservatives*** *1*
- ***Fumaric acid*** *0.5*

Formulation

- Low carb
  - Increase water – fiber + protein
- Paleo
  - High water due to unique flours used
- Cauliflower
  - High water naturally from cauliflower
- Bean
  - Increase water, pulse protein and fiber
- Vegetable based



Formulation

- Unique formulas will need different processing parameters
  - Mix Time
  - Mixer type – Horizontal vs Spiral Mixer
  - Divider style – Extruder vs piston
  - Press vs Sheeted or Die Cut

Troubleshooting - Process

- Mixing
  - Time + Temperature vs Dough Development
    - Each formula or size will have a specific mixing time
    - As mix time increases temperatures increase
      - Increased temperatures lead to translucency
    - Cadence for mixing doughs is 1 dough every 20 minutes (3 – 4 doughs every hour)
    - As dough gets older, translucency increases and shapes become inconsistent

Proofing

- Dry proofer
  - Crusty dough balls
  - Poor size, no extensibility in the press
- Wet Proofer
  - Sticking to proofer cups
  - Doubles

Troubleshooting Tortilla Faults

- Understanding cause and effect and how to solve a problem

Troubleshooting Tortillas

- Sticking
- Edges
- Shapes
- Staling
  - Rollability / Foldability
  - Mouthfeel

Sticking – Package

- Sticking Defined:
  - Two or more tortillas that will not separate from each other without tearing or ripping after being packaged for any period of time.

- Sticking can be caused by several factors
  - Process
  - Ingredients
  - Formulation.

Sticking - Press Setup

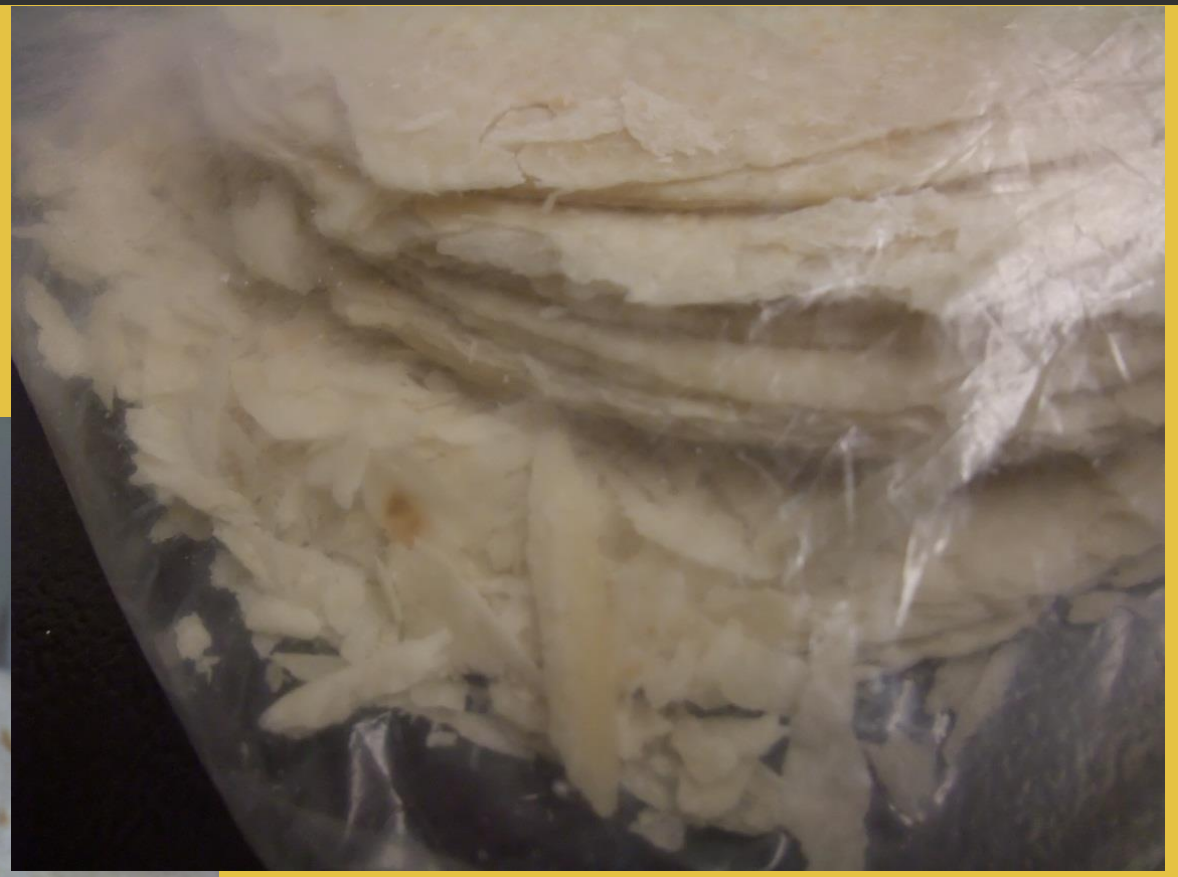
- Dry, stiff doughs require increased pressure, dwell time and temperature to obtain correct sizes
  - ✗ gelatinizes (cooks) starch, sets structure
  - ✗ activates all leavening
  - creates top and bottom crust which entrains steam increasing the likelihood of pillowing (puffing)
- Ideal press settings
  - ✓ dwell time = ~1.3 seconds +/-0.2
  - ✓ pressure = ~ 1000 psi +/- 200
  - ✓ temperature = ~375 / 400 +/- 25°F
  - ✓ New Mega Presses = < 325°F

Sticking - Baking Profile

- Over baking - creates pillowing or puffing
  - top -thin crust separates from thick -bottom crust
  - thin crust and blisters are weak
    - tear and flake

Over baking

Over baking + Zippering



Sticking - Cooling Room

- Purpose of the cool down is to fully prepare the tortilla for packaging, transportation and storage
- Typical cooler conditions
  - cool and HUMID, 35 - 40°F @80%+RH
    - Room is cool and wet causing mist / dew / fog to condense back on the tortilla
- Cooler conditions must be adjusted to obtain:
  - Tortilla pack temperature +/- 10°F package room
  - Humidity < 60%RH – critical

Sticking - Packaging

- Minimize temperature shifts after packaging
  - promotes moisture migration
    - 80°F packing into case
    - 50 -100°F warehouse temperature
    - 20 - 140°F truck shipping temperature winter / summer
    - 70°F grocery store temperature
    - 40°F consumer refrigeration
- Avoid excessive compression
  - over-packing
  - excessive weight

Sticking -Ingredient causes

- Flour - weak flour
  - poor gluten quality, although quantity may be available
  - translates to:
  - poor dough process tolerance
  - weak baked film formation
  - poor resistance to compression
- Add Vital Whaet Gluten

Sticking - Reducing Agents

- L-Cysteine and sodium metbisulfite
  - greater extensibility in the dough
  - higher levels (>60ppm) lead to weak protein and crust resilience.
  - Increases the occurrence of sticking

- Obtain dough consistency through full mix development

Sticking –Fat Type

Type of fat being used is critical:

- Liquid oils remain liquid at room temperature
  - Increases surface adhesion on the tortilla
  - Liquid oils will always create zippering
  - Use <30% of normal levels if using oil (3 Oil for 10 Shortening)

Sugar and sticking

- Sugar is a tenderizer
- Sugar is hygroscopic
- As sugar increases, hygroscopicity increases
  - increases stickiness and tenderness.
  - Dextrose, glucose, fructose and lactose are hygroscopic
- Glycerin can also lead to sticking

SIZE AND SHAPE

Tortilla Size and shapes

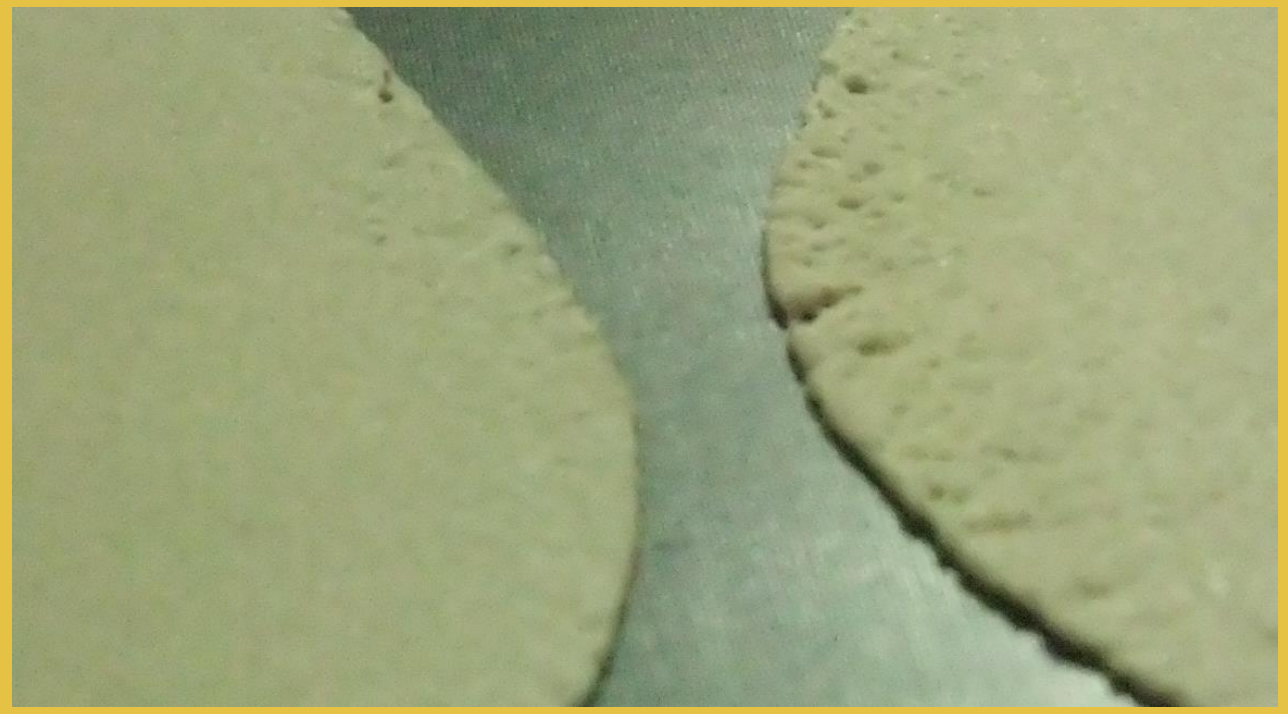
- **Tortillas too small**
  - Strong flour = elastic
  - Under mixed = elastic
  - Under hydrated = dry, elastic
  - Cold dough = elastic
  - Under scaling = insufficient mass / pressure
  - Excessive floor time after mixing / dough frequency
    - 3 doughs per hour is the minimum rate
    - fresh dough every 20 minutes
  - = / > than 30 minutes per dough will cause the last part of the dough to become dry
  - Poor press set up
  - Oven shrinkage
    - Protein elasticity, insufficient press energy imparted to dough

Tortilla Sizes –Too Large

- Overly extensible dough
  - **Flour quality -Poor**
  - **Protein quantity / quality**
  - **Over mixing**
  - **Hot dough***
  - **High levels reducing agents**
  - **Press – too severe**
    - **Excessive dwell time, pressure**
  - **High fat levels >12%**
  - **Over hydration**

Edges

- Lacing
  - Caused by excessive cooking, structure of the dough is set prior to obtaining the desired size
  - Dough is cooked in the press, protein and starch are denatured preventing further mobility, before it gets to the final size
    - Elastic dough
    - Under hydrated
    - Under mixed
    - Low reducing agents



Rough Edges

- Brittle, flaky
  - Curling of the dough out of the press into the oven
    - Cupping caused by large temperature differential between top and bottom plates >25°F
    - Typically top plate hotter than bottom
      - Facilitates release
  - Curled edges expose more surface area to heat
    - Creating toasted edges leading to dry, brittle flaky edges

CONSUMER – ORGANOLEPTIC

Rollability / Foldability

- Staling
  - Starch retrogradation
- Over baking
  - Damaging starch protein
- Lean Formula
  - Lower fat, sugar, gums and emulsifiers

Mouthfeel, bite

✓Short tender bite

- Established by formula and process
  - Lamination
    - From leavening
    - Not over pressed –pressure, dwell time, temperatu

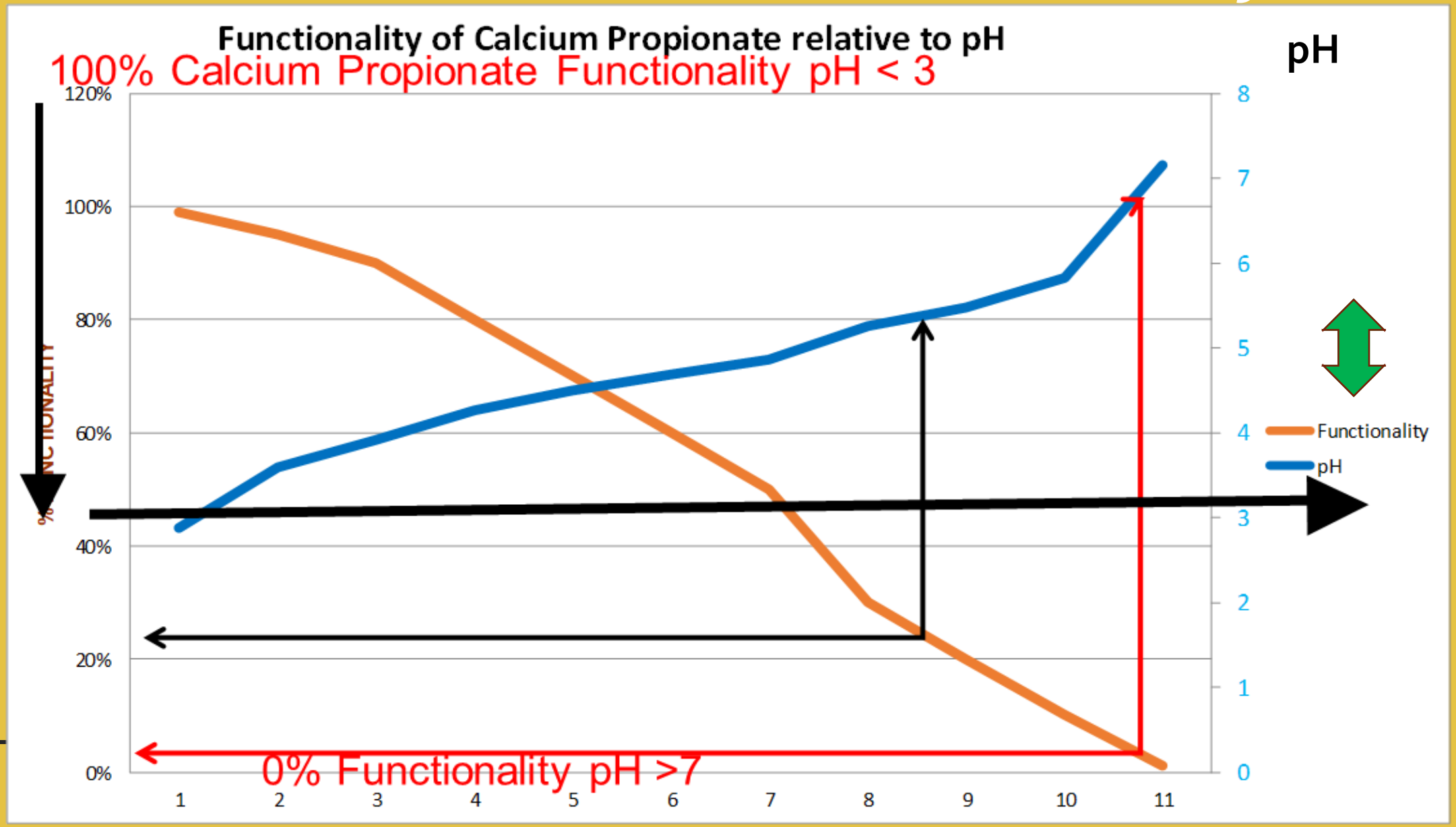
X Leathery, tough bite

- High translucency
  - Insufficient leavening
  - Hot press
  - Extended press dwell times

Microbial Stability

- Balance between:
  - Shelf life expectations
  - pH
  - Preservatives
  - Homogenized ingredients

Microbial stability



QUESTIONS?

- Thank You