How quality control tools can help reducing production problems & improve Tortilla quality

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October 2025

Tortilla making evolution and production challenges

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Tortilla making evolution

Start of **maize cultivation** in ancient Mesoamerica (Aztecs and Mayans)

Start of **corn nixtamalization** to make masa cooked on a flat hot surface → **tortillas**

16th century: arrival of **wheat** tortilla

Technological advancements in the 20th century: mechanized tortilla hot-presses and extruders for **large-scale production**

Evolution of production challenges

From **artisanal** « know how » to **industrial** challenges

« Master bakers with deep hands-on knowledge are retiring, and fewer young people are entering the trade with the same dedication to mastering traditional skills »

Strong **automatization** of the baking lines → *Better **throughput**, but less acceptance for **variability***

Expertise is **gradually leaving** the industry → *Need to put objective **data** on **feelings***

What history means to us

Most of the tools we used today were invented 100+ years ago

- Very different wheats
- Very different industry challenges

Laboratory tools were mostly used by millers

- To help better understand their flour
- To ensure CONSISTENCY

Tortilla makers could rely on expertise to correct

- If flour was not fitting 100%
- Still had the possibility to make it work

Tortilla industry is becoming more complex

- Need to produce different products
- Automatization
- Use of different raw material and additives (enzymes)

Customers are more demanding

- Product quality
- Availability
- Evolution
- Social medias… fame…

FACT: 96% of producers declare experiencing issues despite flour specifications…

Mostly Academics…not daily conducting a process… theoretical POV

96% of **operative bakers** admit still having issues despite flours meeting their COAs (specifications).

We have seen non-conform product rejection costs raising up to 100.000 US$ <u>per week</u>

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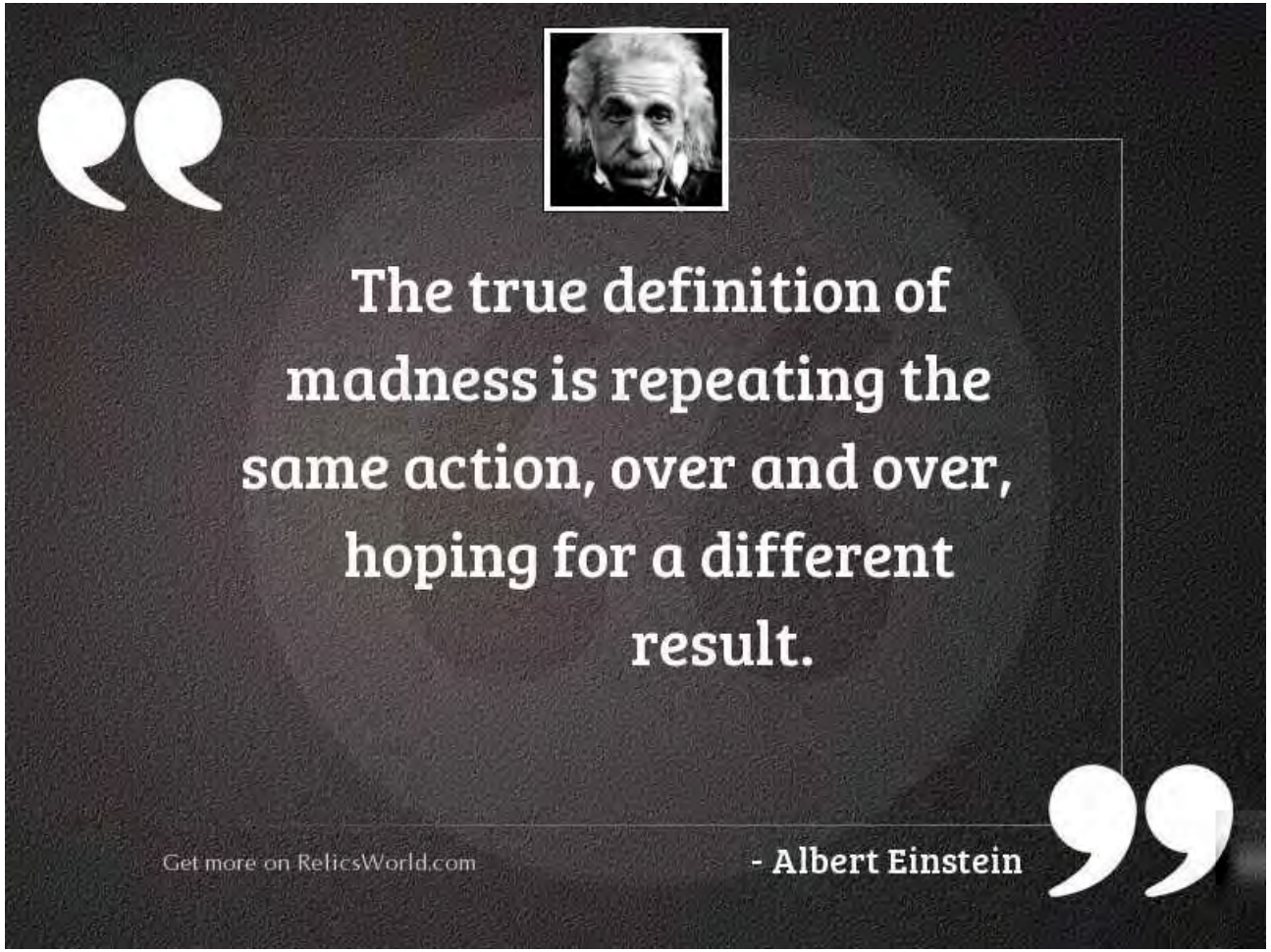
Causes of current specification system failures

- Specifications are miller-oriented “**from flour to final product**”
  → predictive method

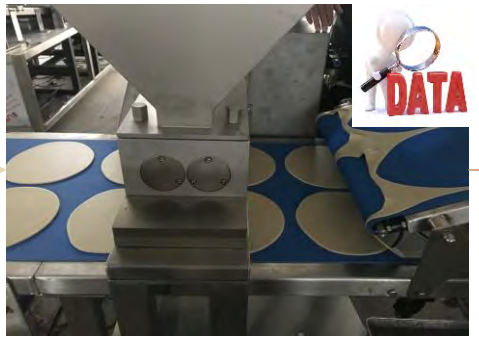
- Specifications often don’t consider >70% of the raw material
  → **starch phase**



The modern QC in which we believe: Guess less, Measure more…

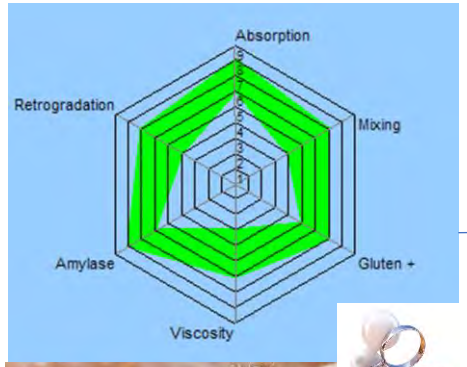
MEASURE PROCESS REAL PERFORMANCE

VISION



UNDERSTAND HOW RECIPE AND PROCESS IMPACT FINAL PRODUCT

DEFINE THE DOUGH CHARACTERISTICS AND FOLLOW CONSISTENCY



DEFINE THE BEST FLOUR ACCORDING TO THE PROCESS

GIVE MILLER SPECIFICATIONS BASED ON OBJECTIVE MEASUREMENT OF WHAT REALLY WORK AT PLANT LEVEL, REDUCE WEIGHT OF "EMPIRISM" or "EXPERIENCE"

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ONLY WHAT YOU CAN **MEASURE**, YOU CAN **IMPROVE**

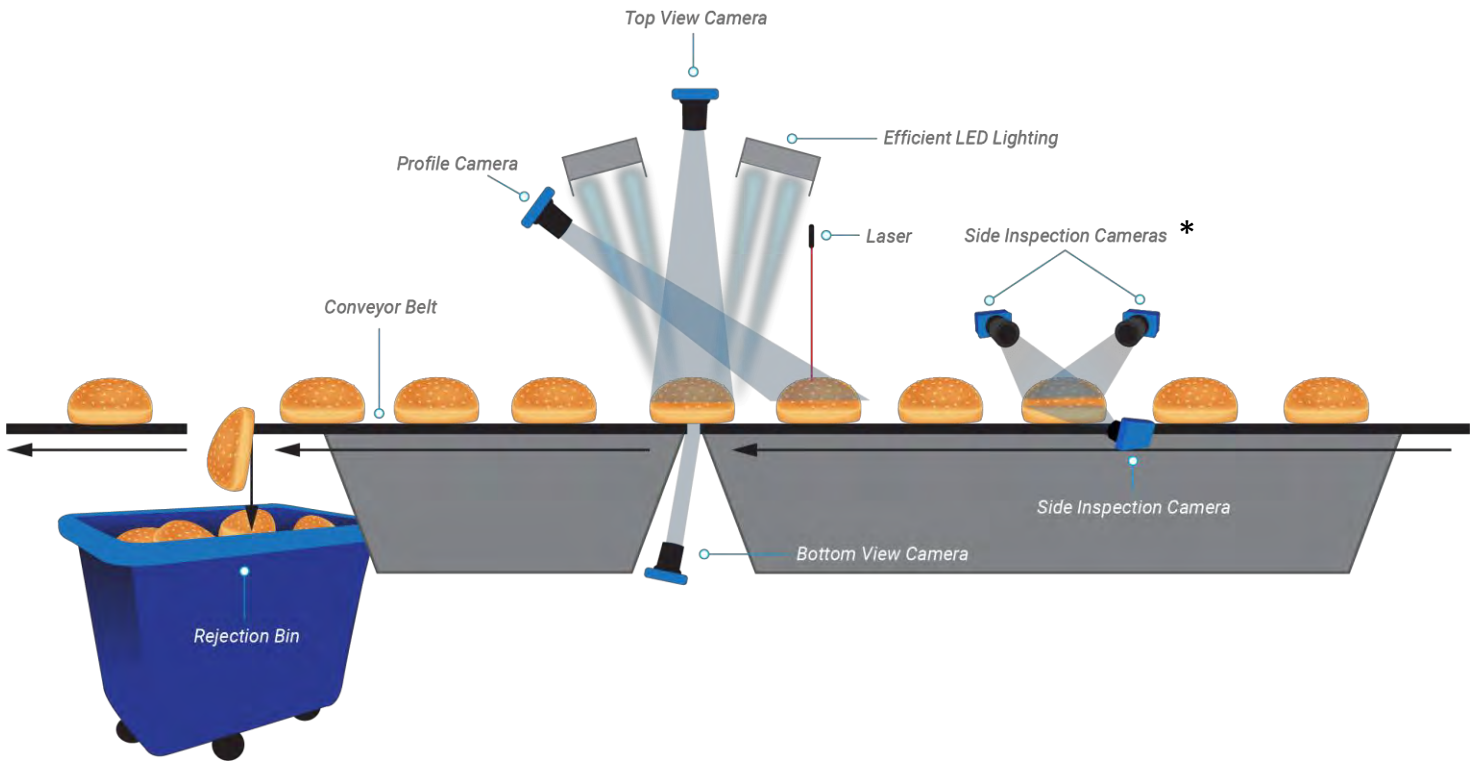
Put numbers on your process

Manual Inspection *vs*. Vision Inspection Systems

It is extremely difficult to find and keep staff performing high quality inspection and sorting

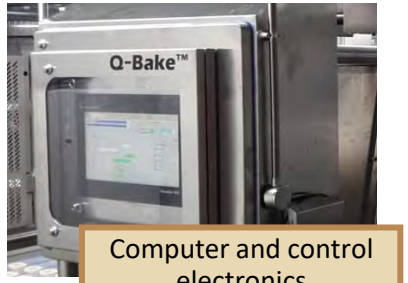
	Manual Inspection (inline)	Vision Inspection (inline)
Capability	Top, random bottom, color, obvious defects	Top, bottom, color, height, dimension
Throughput	Spotty Inspection	100% inspection
Consistency	Varies from person to person, from time to time. Physically and mentally difficult, boring. The mind will wander	Consistent
Subjectivity	Based on human judgement, training and experience	Specification based on statistics
Cost	Direct labor cost and hidden cost – training, recruiting, loss of production etc.	Initial capital investment, ongoing maintenance and cleaning
Data	Limited or no data (0.1% of production analysed). Will the baker change the process based on this amount of data?	Large statistical data for statistical analysis and process improvement
Intelligence	Limited or no intelligence	Real time production and process intelligence on dashboard

Architecture of Vision Inspection System with Rejection



*Side inspection not typically used in bakery applications

Five Key Components



Computer and control electronics

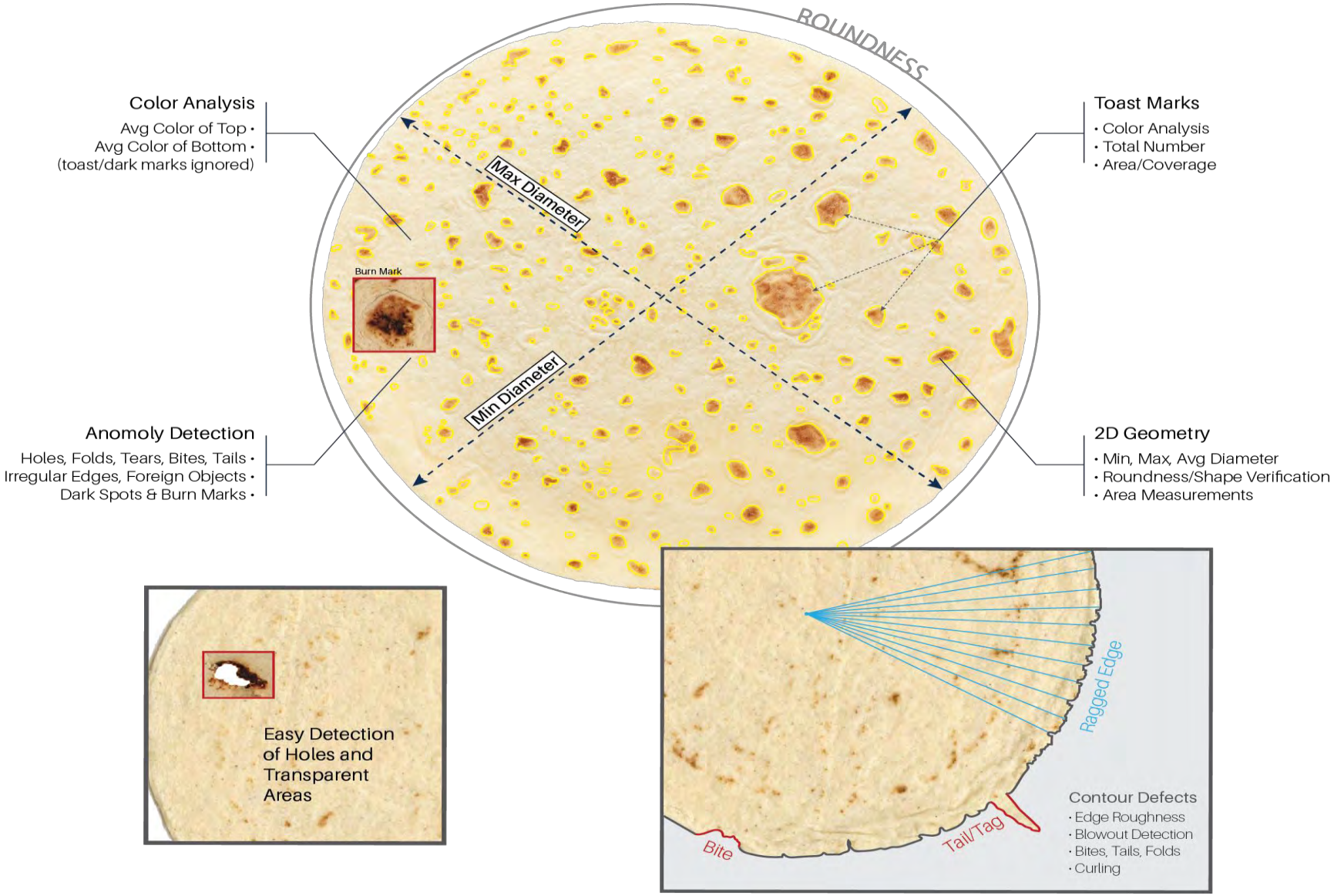
Cameras

Lighting source (LEDs & Lasers)

Conveyer and ancillary electronics

Rejection and defective products transfer

What Can Vision Inspection System Measure ?



Put numbers on your dough properties

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What can we measure?

- We measure the torque produced by a dough between two blades at constant mixing speed during successive phases at distinct temperatures.
- This can be related to the **evolution of the dough consistency** during mixing, baking and cooling !

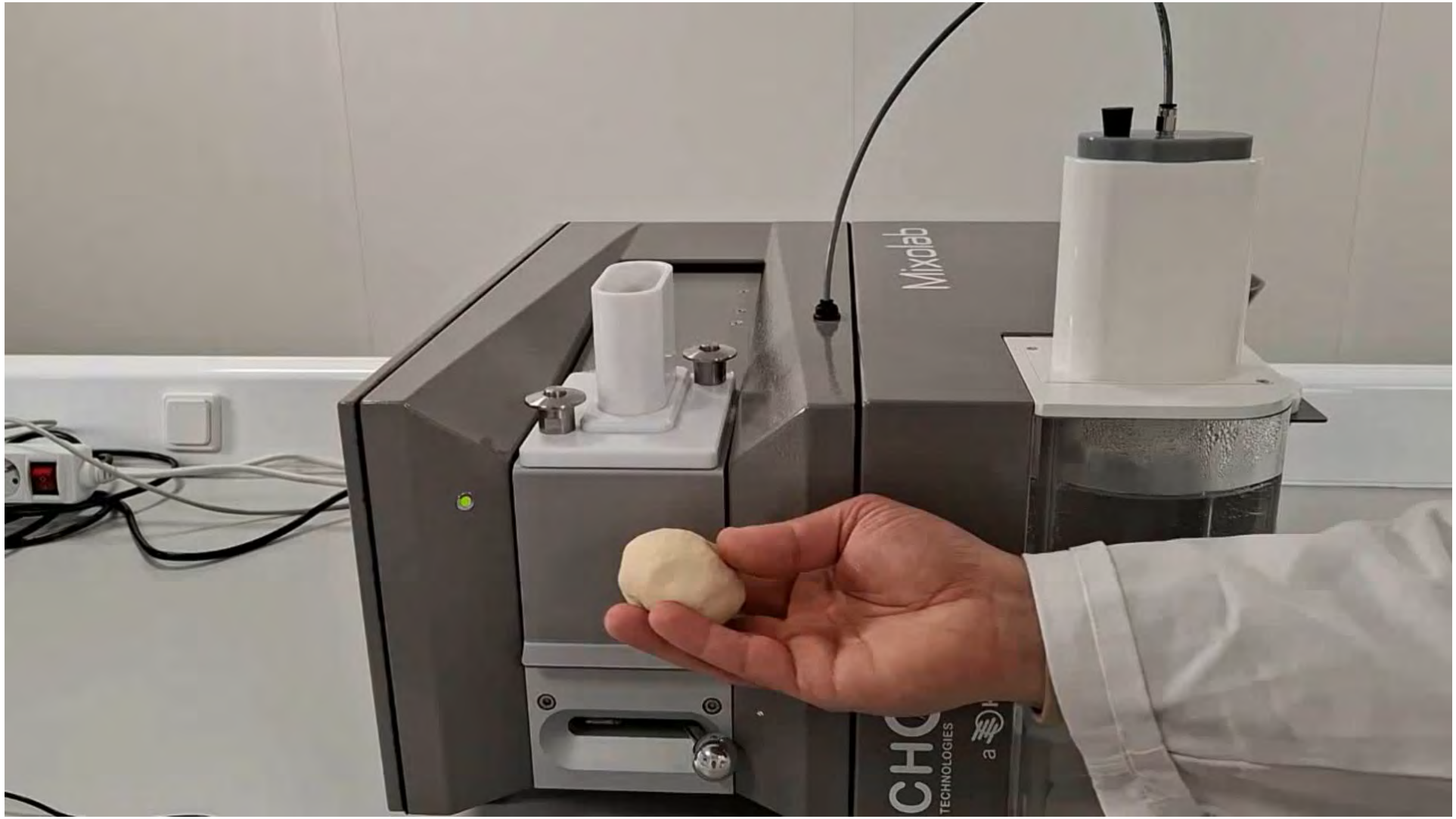
What is the test concept?

- To access a maximum of data :
  - Proteins behavior
  - Starch behavior
  - Enzymes impact
  - Combinations…
- In one fully automated test,
- With only 50g of sample,
- Using a standardized, internationally recognized method !

Compliant with

ICC 173/1 ; AACC 54-60-01 ; NF V03-765 ; ISO 17718:2013 ; GOST R 54498-2011

Analyzing production dough has never been easier !



For any types of doughs, up to the most challenging!

Pancake Dough

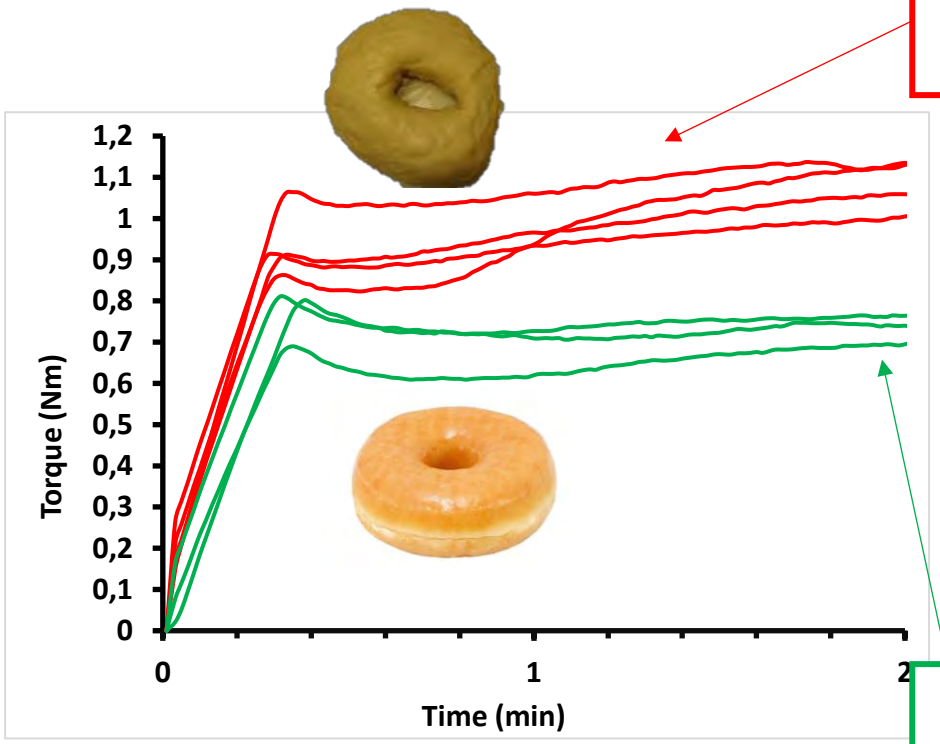
Cake Dough

Crumble Dough

VERY Sticky Dough

Real life examples

DONUT PRODUCTION

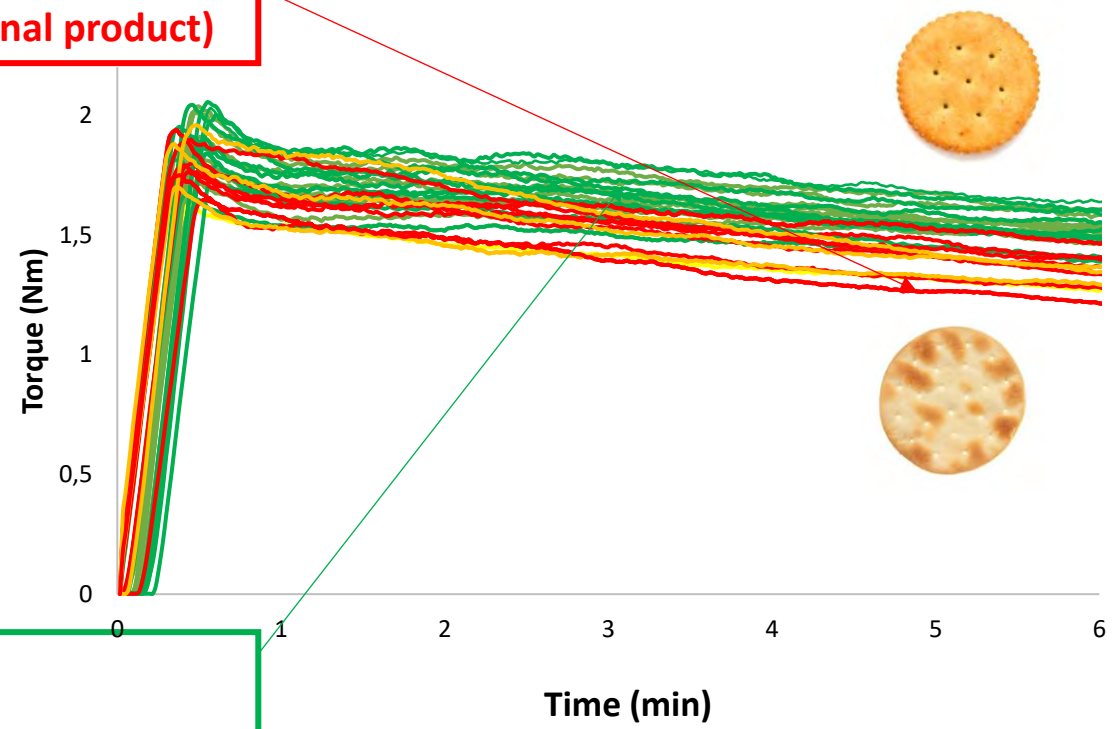


Target: [0.69 to 0.8 Nm] at 2 min

OUT
(bad dough / bad final product)

IN
(good dough / good final product)

CRACKER PRODUCTION



Target: [1.45 to 1.86 Nm] at 6 min

RESULTS IN LESS THAN 8MIN → COMPATIBLE WITH PRODUCTION SPEEDS

Put numbers on your Flour quality

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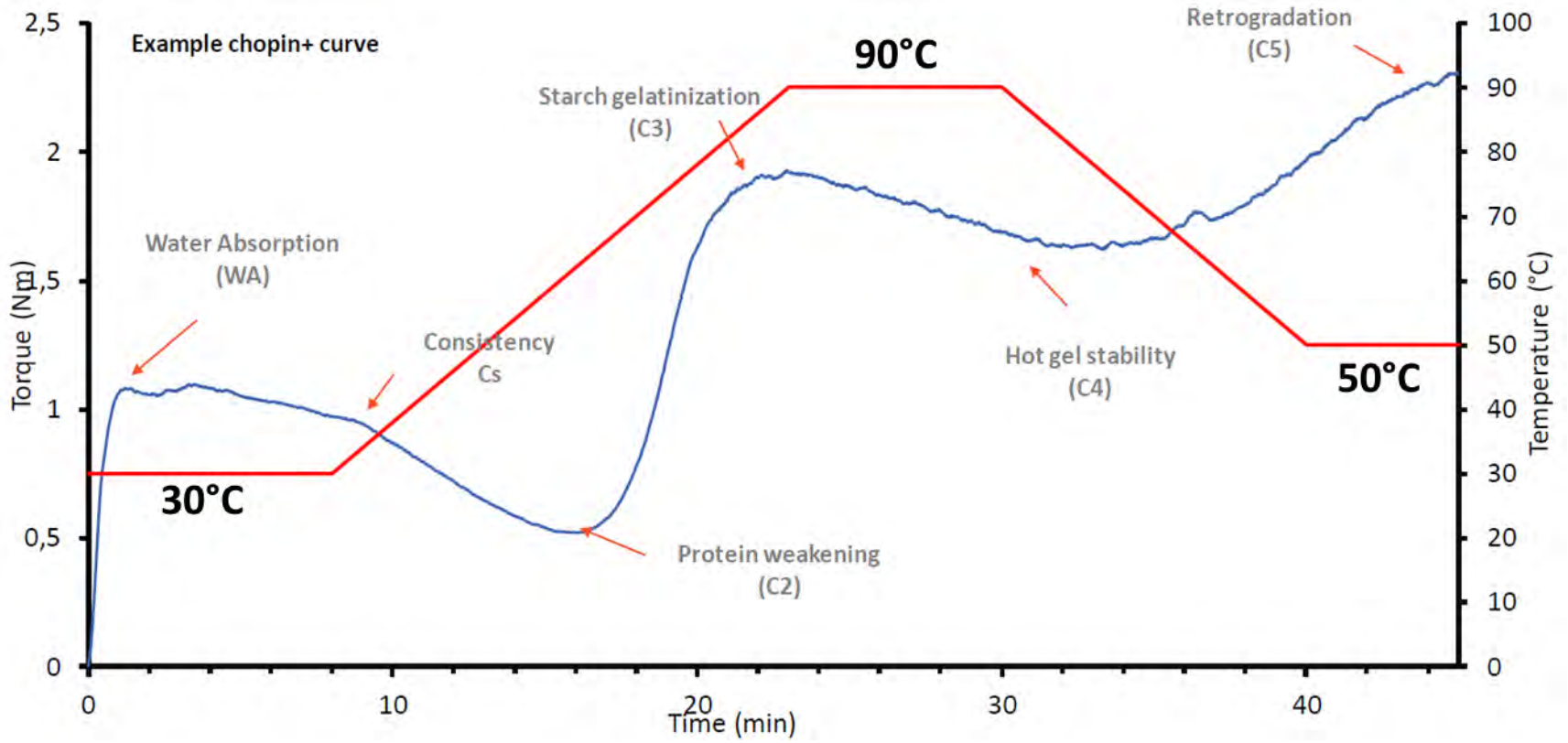
Results : Chopin + Protocol

Analyzes:

- Water absorption
- Effect of mixing
  - Development time
  - stability
- Protein denaturation
- Starch gelatinization
- Amylase activity
- Starch retrogradation



- 5 temperature zones
- Mixing speed 80rpm
- Constant hydration or adapted hydration
- **Customizable for different cereals or various applications**

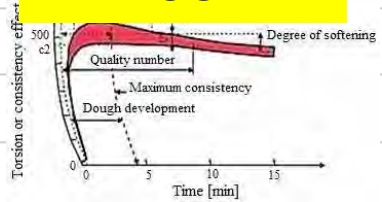
Compliant with

ICC 173/1 ; AACC 54-60-01 ; NF V03-765 ; ISO 17718:2013 ; GOST R 54498-2011

Zone 1 – Dough development

WHAT YOU KNOW TODAY…

FARINOGRAPH



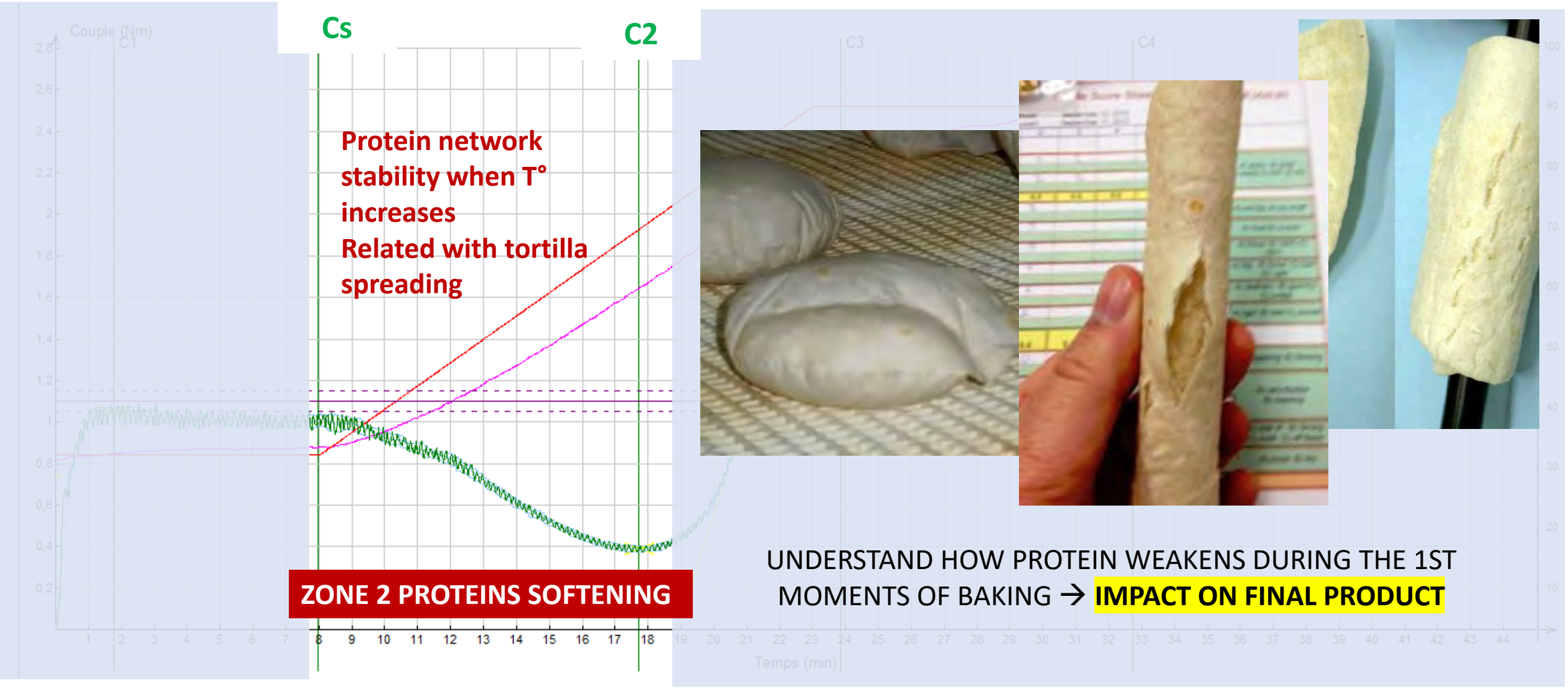
ZONE 1 DOUGH DEVELOPMENT

Water absorption
Mixing time
Stability
Weakening

WHAT YOU MIGHT KNOW TOMORROW…

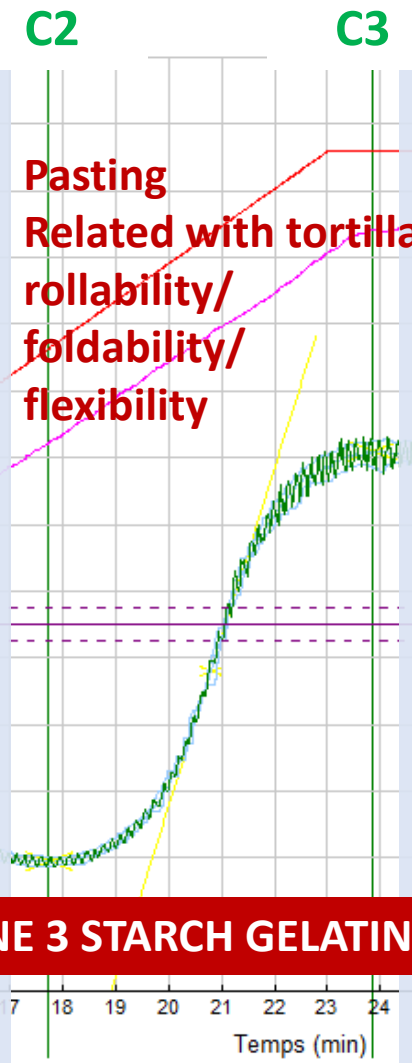
82% OF MIXOLAB TEST INFORMATION IS **UNIQUE**

Zone 2 – Proteins softening

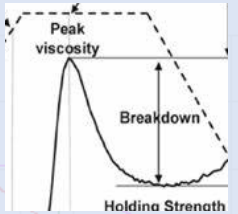


UNDERSTAND HOW PROTEIN WEAKENS DURING THE 1ST MOMENTS OF BAKING → **IMPACT ON FINAL PRODUCT**

Zone 3 – Starch gelatinization



ZONE 3 STARCH GELATINIZATION



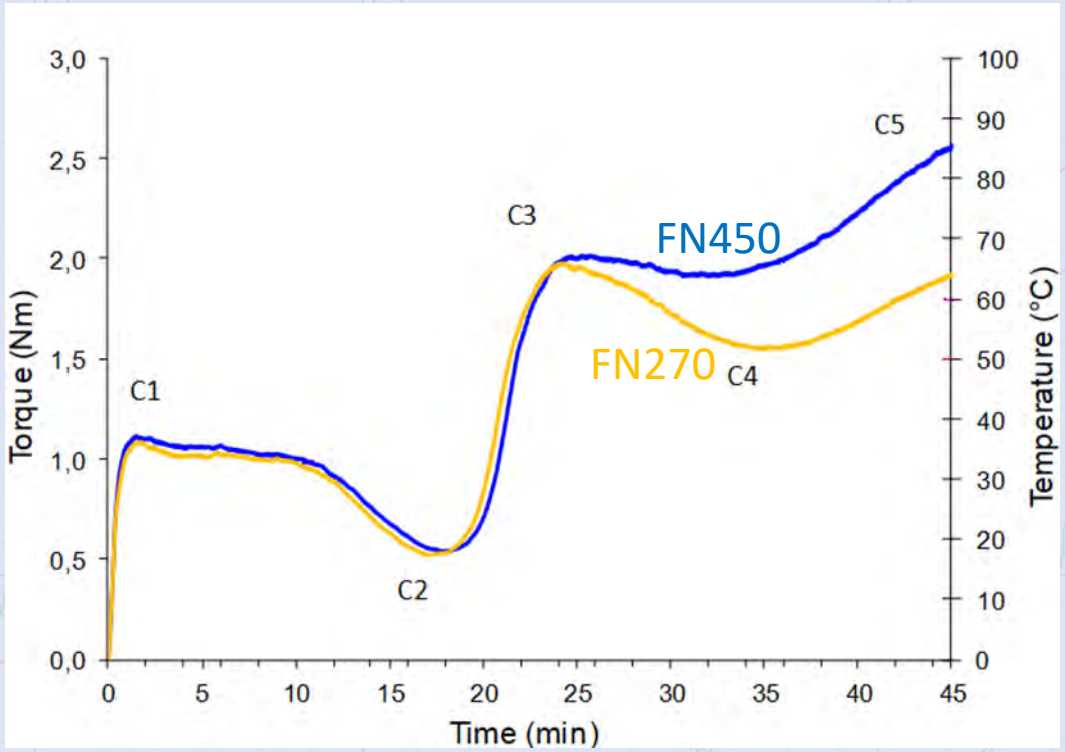
Looks like Viskograph or RVA curves but:

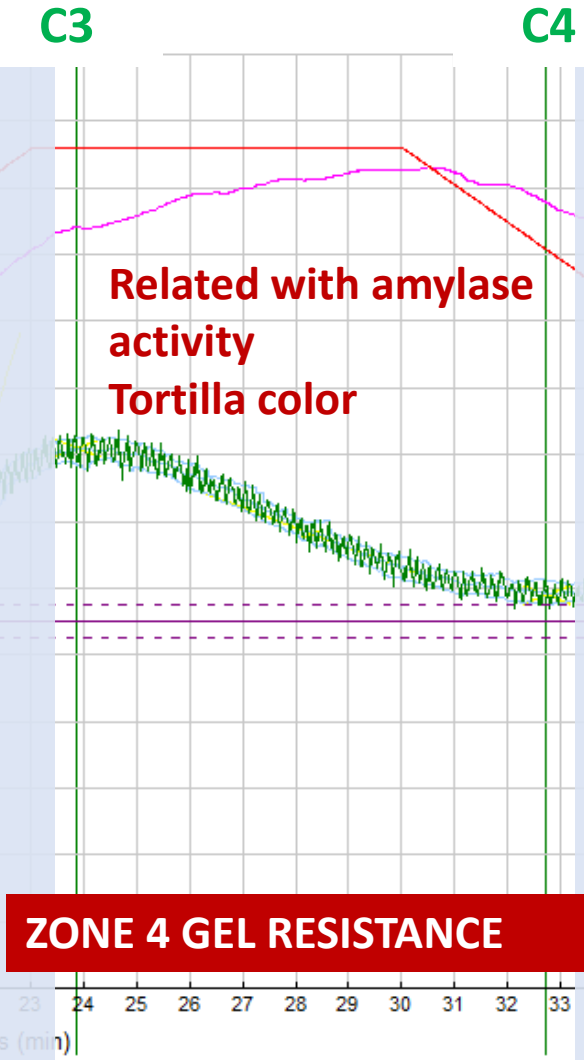
- Mixolab average WA: 60% → **DOUGH SYSTEM**
- RVA test 780% → Slurry (Liquid)
- Viskograph test 560% → Slurry (Liquid)

In a DOUGH SYSTEM :
Water mobility and availability is limited.
COMPETITION and INTERACTION between components CRITICAL

→ MORE REPRESENTATIVE

Zone 4 – Enzymatic hydrolysis





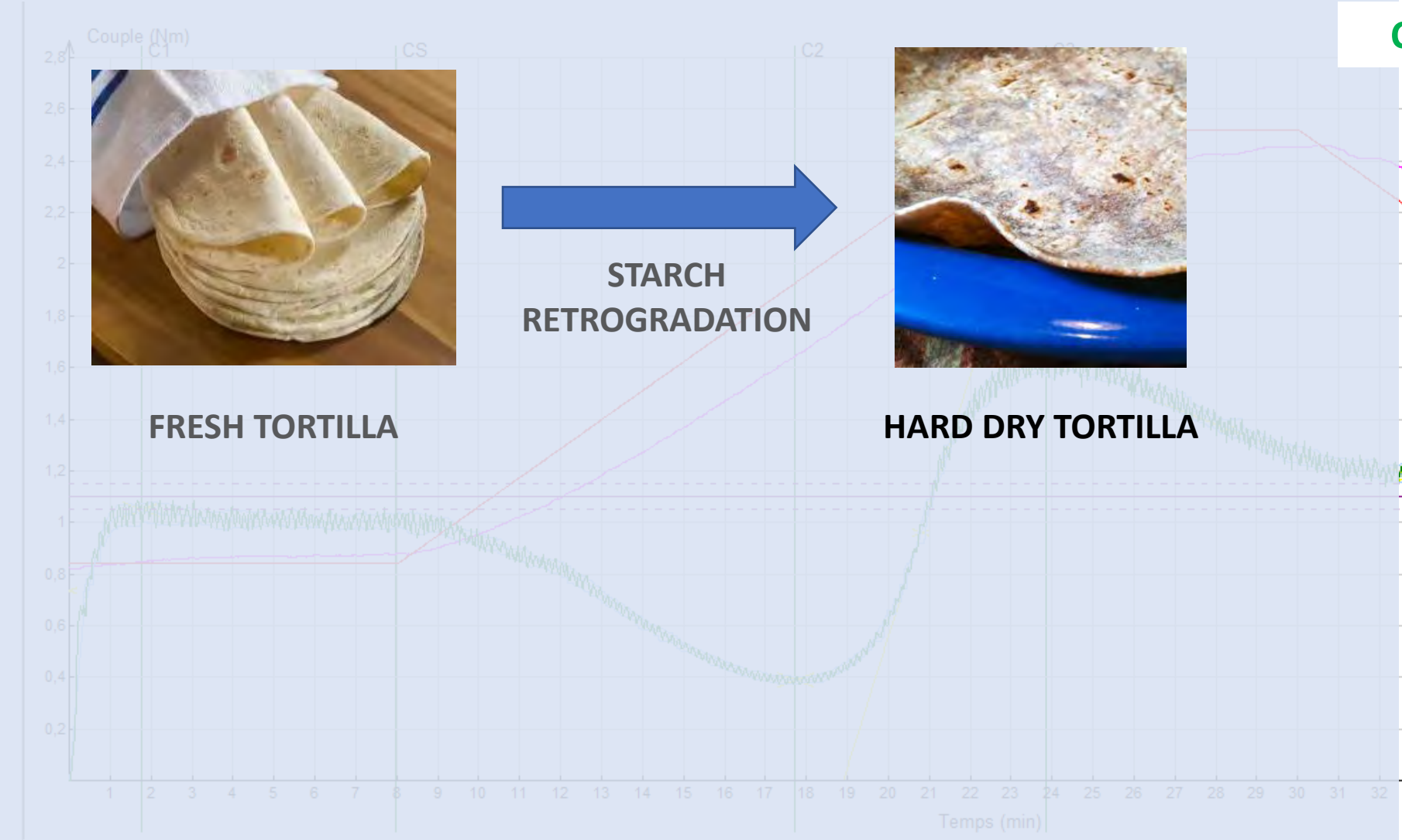
Mixolab has NO LIMIT to measure amylase activity (whatever the source or specificities)
More generally because acting on DOUGH SYSTEM Mixolab perfectly picks the ENZYMES and INGREDIENTS actions more realistically

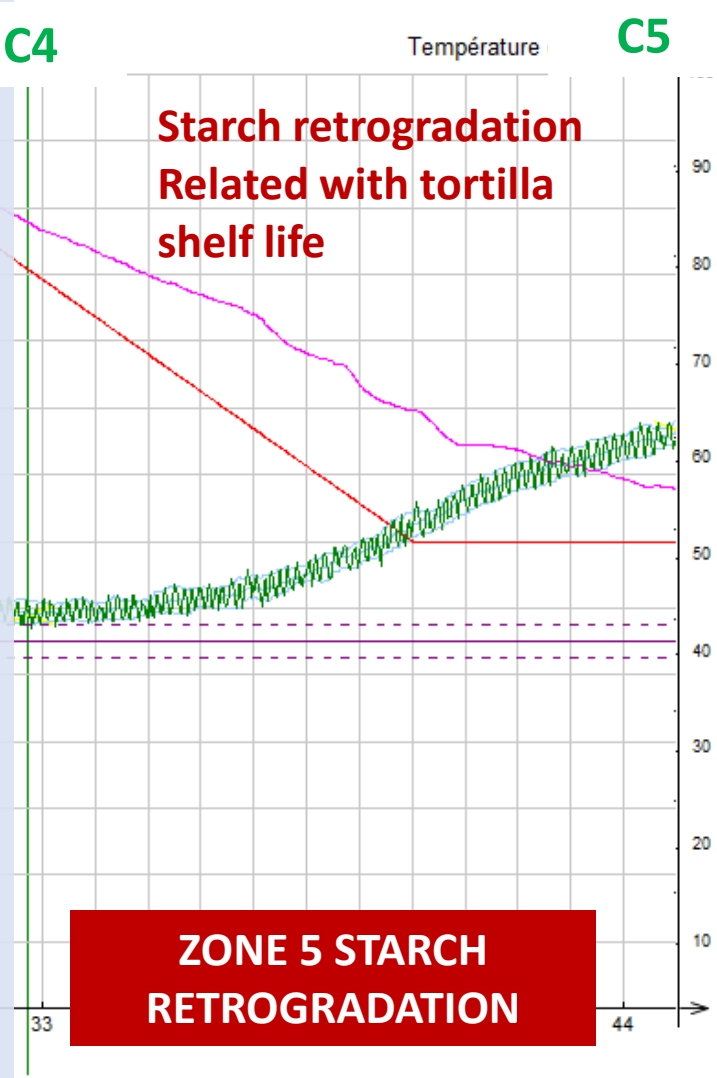
Zone 5 – Starch retrogradation

FRESH TORTILLA

STARCH RETROGRADATION

HARD DRY TORTILLA

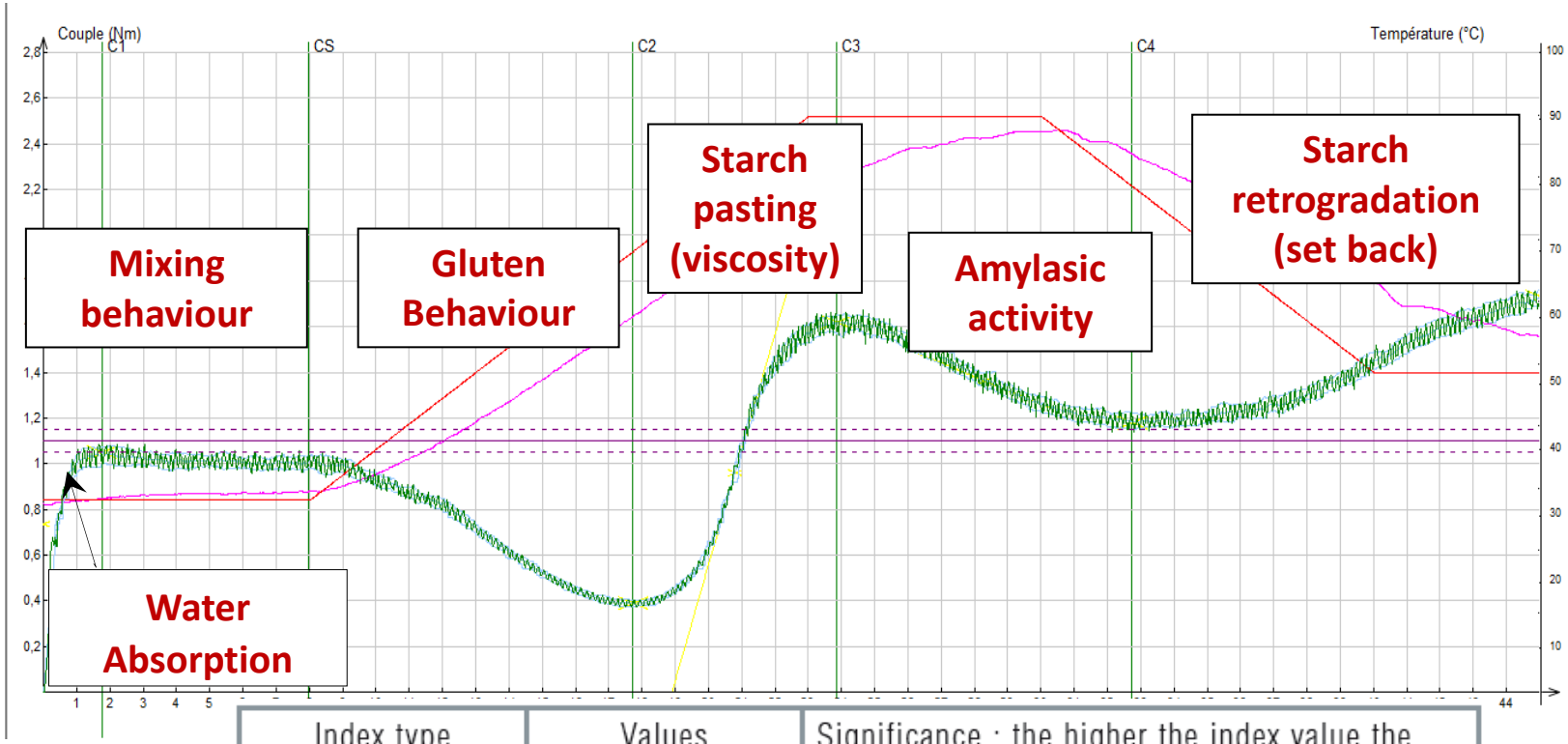




WHAT IS THE MIXOLAB PROFILER?

The Profile is a « Curve Translator »

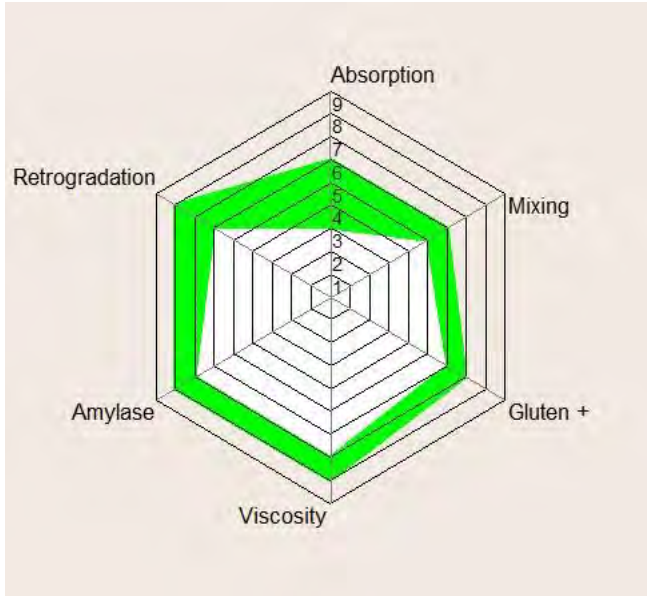
It converts the standard graph into a very comprehensive quality control tool grading from 0 to 9

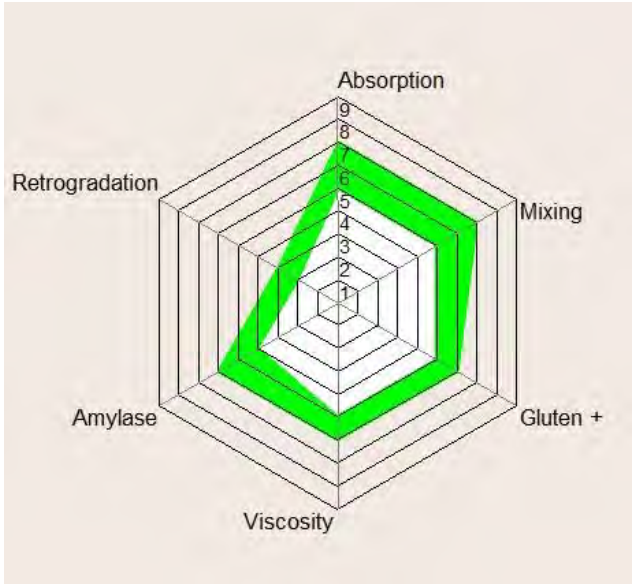


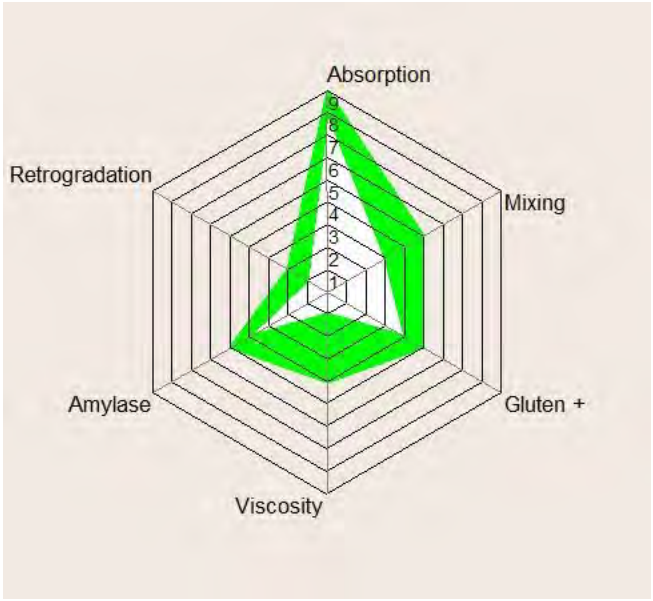
Index type	Values	Significance : the higher the index value the...
ABSORPTION	From 0 to 9	... more the flour absorbs water
MIXING		... more the flour is stable at kneading
GLUTEN+		... more the gluten resists heat
VISCOSITY		... greater the dough's viscosity when heated
AMYLASE		... weaker the amylase activity
RETROGRADATION		... shorter the cooked product's shelf life will be

Create your own target to screen your flour and be able to detect not well performing flours

DIFFERENT PRODUCTS = DIFFERENT PROFILES

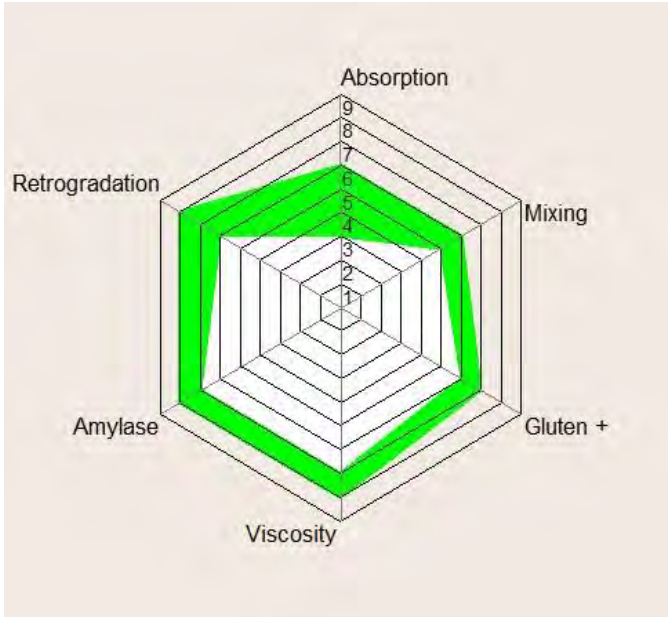




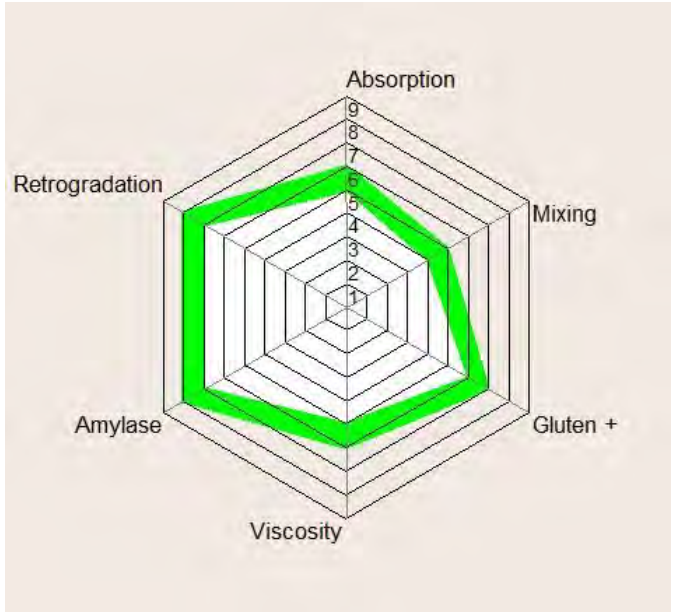


FLOUR + PROCESS = FINAL PRODUCT

Country 1



Country 2



Country 3

Conclusions

The modern QC in which we believe: Guess less, Measure more…

MEASURE PROCESS REAL PERFORMANCE

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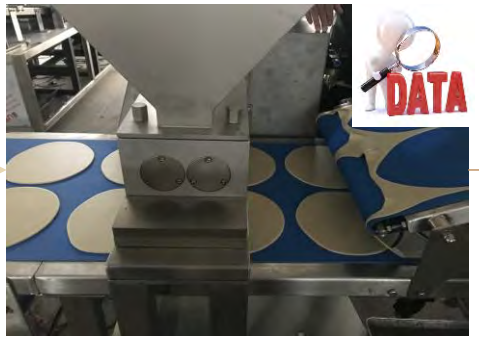

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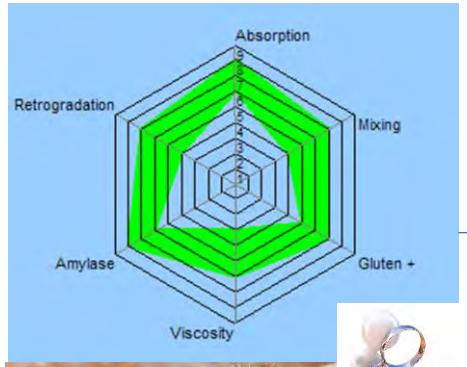

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