



INDUSTRIAL MIXING PROCESS – CLEAN LABEL PRODUCTS



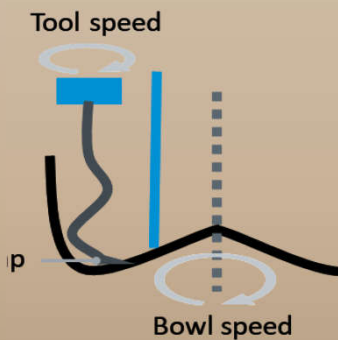
BAKERY SEMINAR - MAY 14th 2019

José CHEIO DE OLIVEIRA -R&D MANAGER

PLANNING



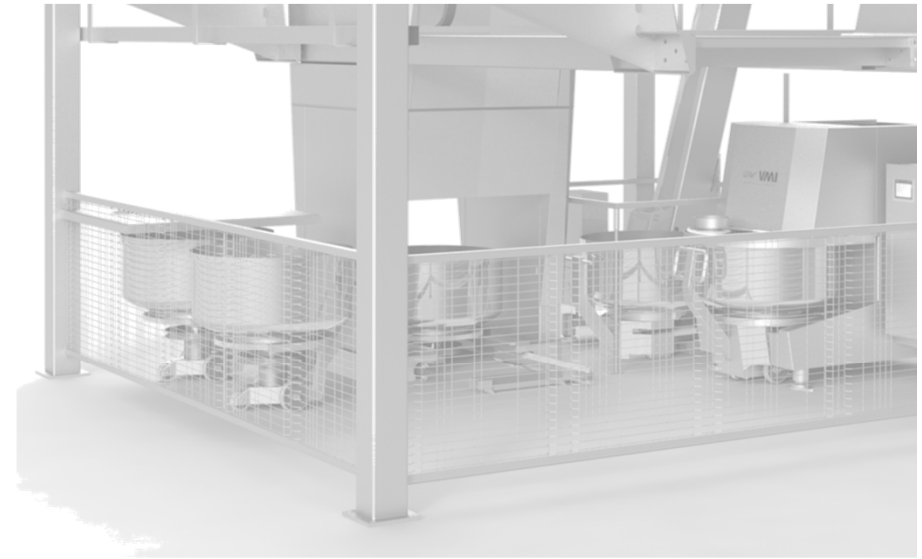
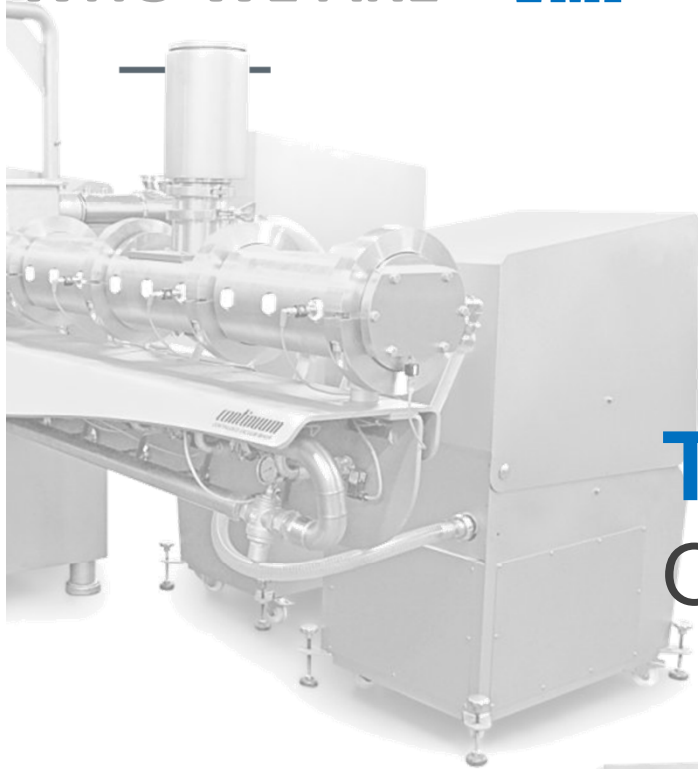
WHO WE ARE



UNDERSTANDING MIXING PROCESS
PARAMETERS TO BETTER CONTROL
CLEAN LABEL PRODUCTS



WHO WE ARE – **VMI**

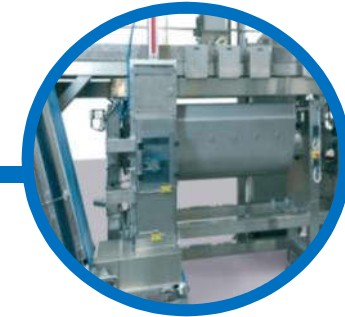


THE LARGEST PORTFOLIO
OF MIXING SOLUTIONS



WHO WE ARE – VMI

250 continuous mixer



390 Automatic systems



110 Horizontal mixers
(vaccum)



250 (Planetary mixers)



Introduction to Bakery/pastry applications



Batters: Cakes,
madelines,
muffins,
waffles



Short dough:
sweet biscuits,
shortbread,
ginger nuts,
digestive



Hard dough:
semi sweet,
biscuits, rich
tea, marie,
crackers



Dough: Bread,
brioche,
baguette



MIXING PROCESS FOR BATTER/DOUGH



Tweedy, APV



- Hydration and dissolution of ingredients
- Uniform distribution of all components
- Air bubbles incorporation & distribution
- Development of protein network

- On stage mixing
- Ingredients dispersion
- Air incorporation
- Temperature
- Rework high
- Batter smooth viscous or liquid

Batter



- Ingredients blending
- Low energy
- 2 stage mixing
- Time to be controlled
- Minor rework
- Crumbly, short, dry, bity, cool

Short dough



- Gluten development
- High energy
- On stage mixing
- Temperature
- Rework high
- Dough smooth elastic oily uniform warm

Hard dough



- Ingredients blending
- Ingredients hydration
- Kneading
- 2 stage mixing
- Temperature to be controlled
- High rework
- Smooth, extensible, fine aerated

Bread dough



IMPACT OF CLEAN LABEL ON MIXING SOLUTIONS

- CL means no artificial ingredients, enhancers, preservatives... SO the quality of the dough/batter is not the same



MIXING COULD BE A PART OF THE SOLUTION

DOUGH
HOMOGENEITY

DOUGH CONSISTENCY

DOUGH AERATION



MECHANICAL EFFECT

AIR BUBBLES
INCORPORATION

INGREDIENTS DISPERSION

PRESSURE/VACCUM
APPLICATION



HOW/WHY MIXING COULD HELP TO DOUGH/BATTER QUALITY

MIXING PARAMETERS: DOUGH CONSISTENCY

WHAT IS KNEADING ??



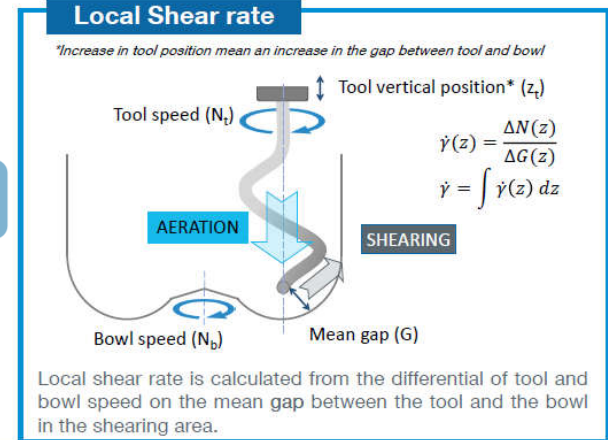
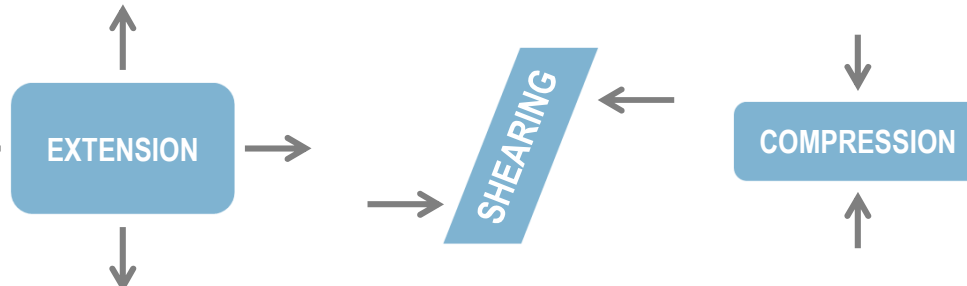
MIXING
Homogenization
Hydratation

STRUCTURATION
Energy transferred
Network formation

AERATION
Air entrapment

OVERMIXING
Network break
Dough rheology

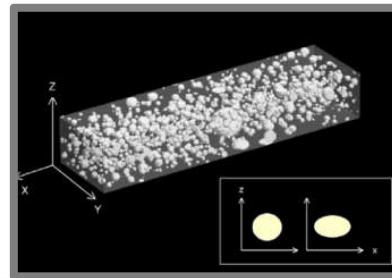
GLUTEN NETWORK STRUCTURATION (Mechanical effect /depend on mixer)



**AERATION,
Air incorporation**



Dough
aeration



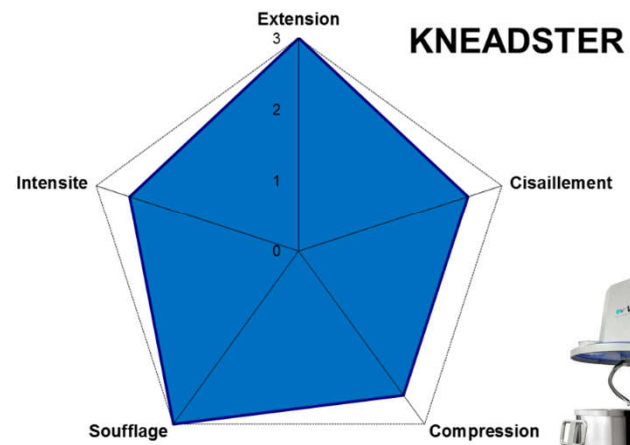
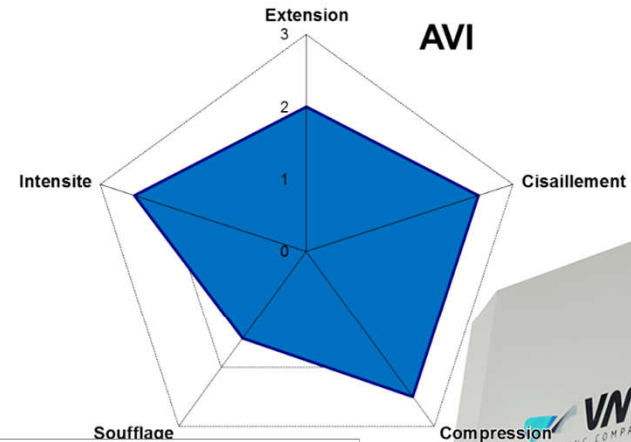
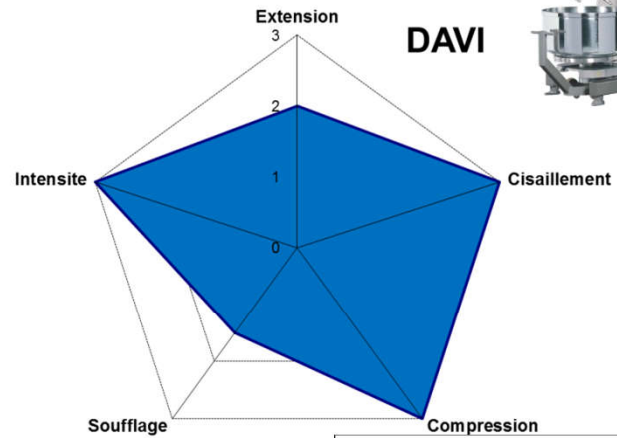
**ENERGY INPUT
Inclusion distribution**



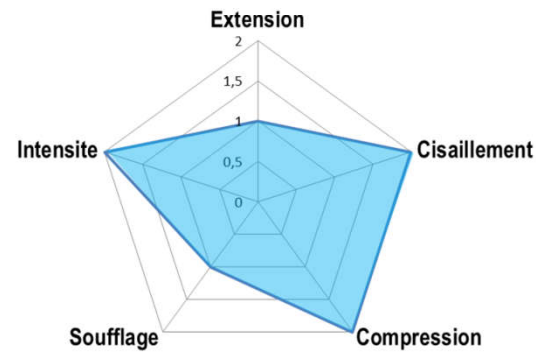
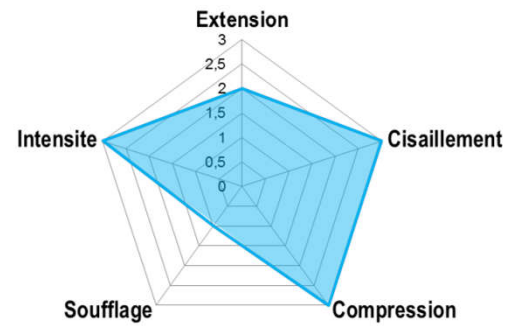
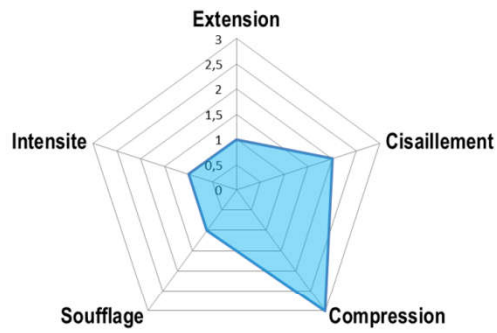
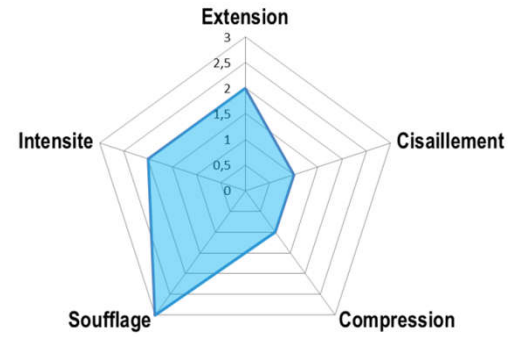
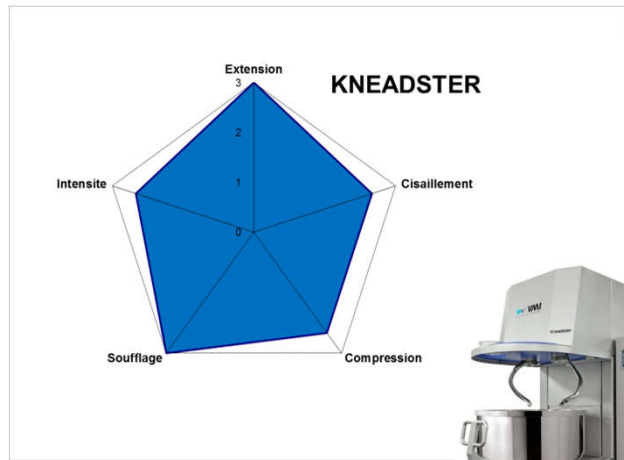
Mixing
intensity



KNEADSTER – COMPLIANT MIXER



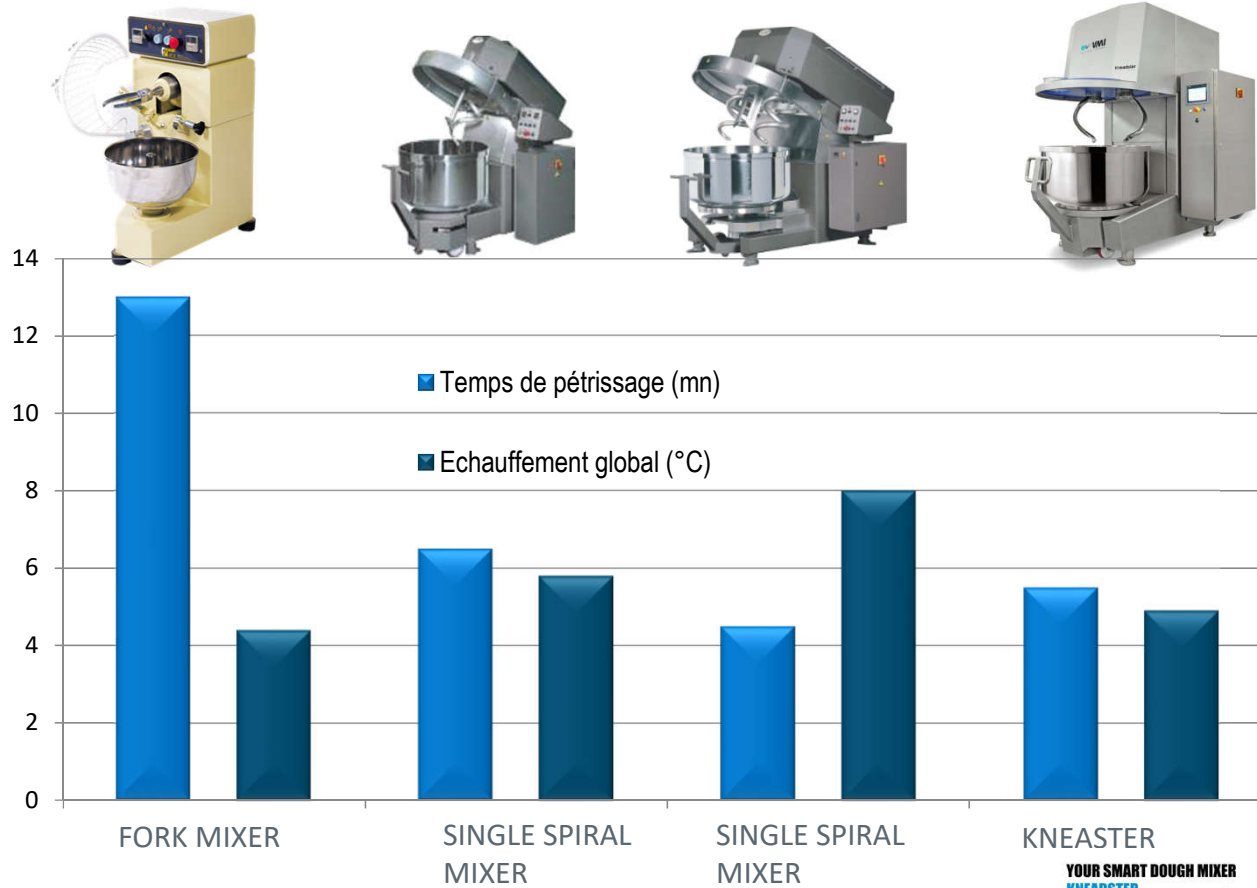
KNEADSTER – A COMPLIANT MIXER



KNEADSTER - MERGING FORK & SPIRAL MIXER



Combining fork mixer (dough handling) & spiral mixer (mixing time)



BATTER AERATION CONTROL ON PLANETARY MIXER



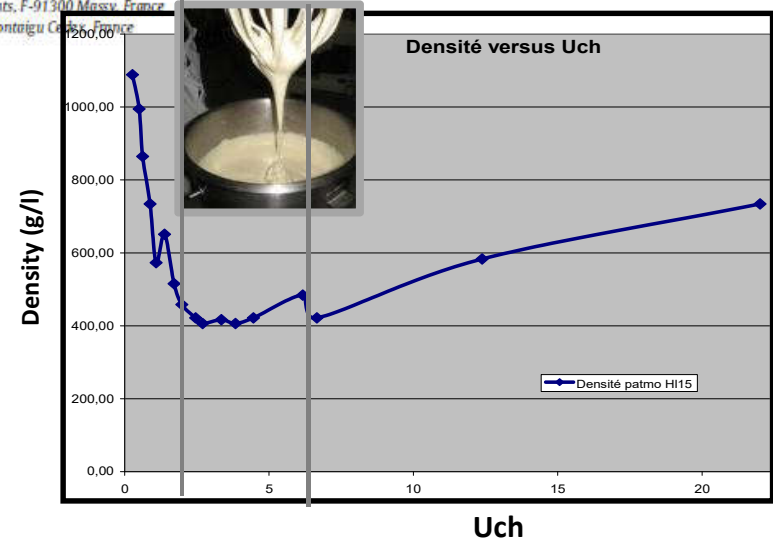
-Optimum density reached for $2 < U_{ch} < 6$
 $U_{ch} = F(\text{center distance, } \varnothing \text{ tool, Ratio, } V_{\text{satellite}})$



Influence of whip speed ratios on the inclusion of air into a bakery foam produced with a planetary mixer device

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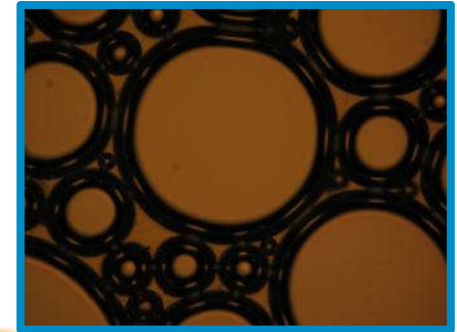
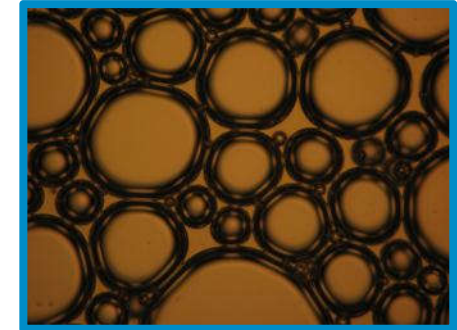


PARTENERSHIP: INRA (national agronomic research institute)

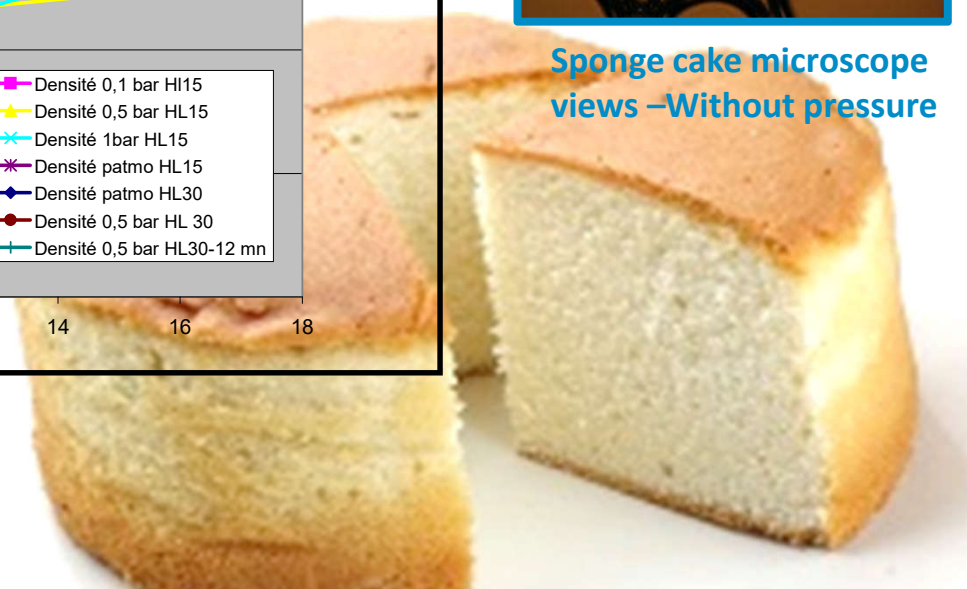
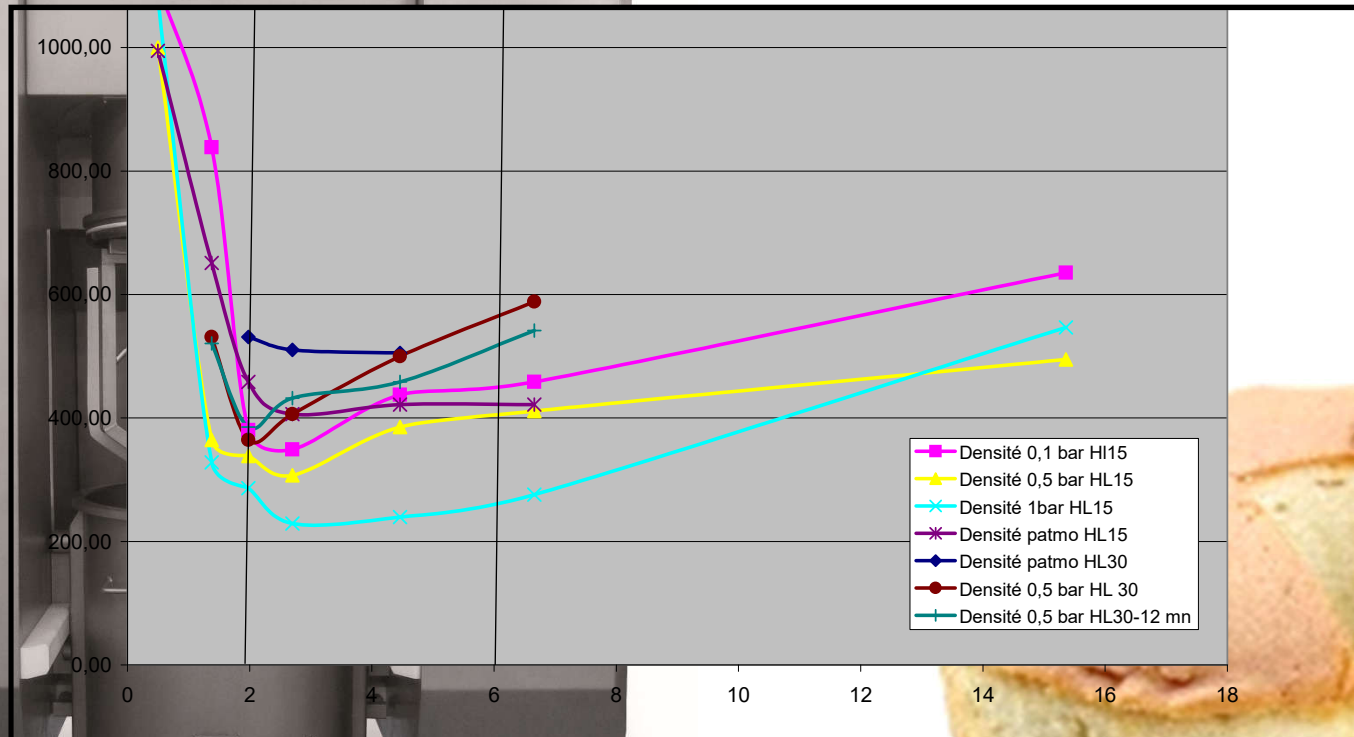
AERATION CONTROL



-Same results for different operating conditions (pressure)

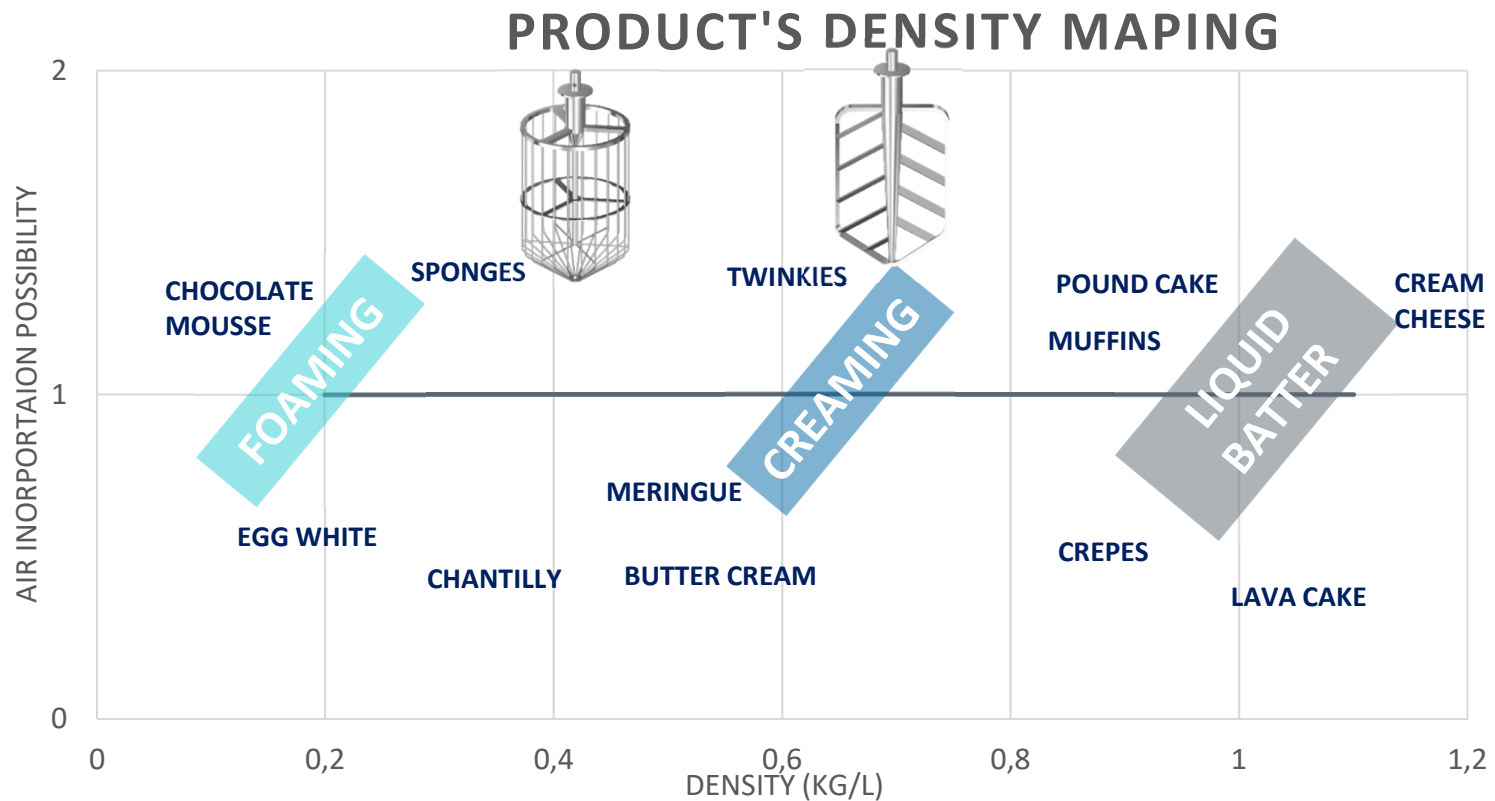


Sponge cake microscope views –Without pressure

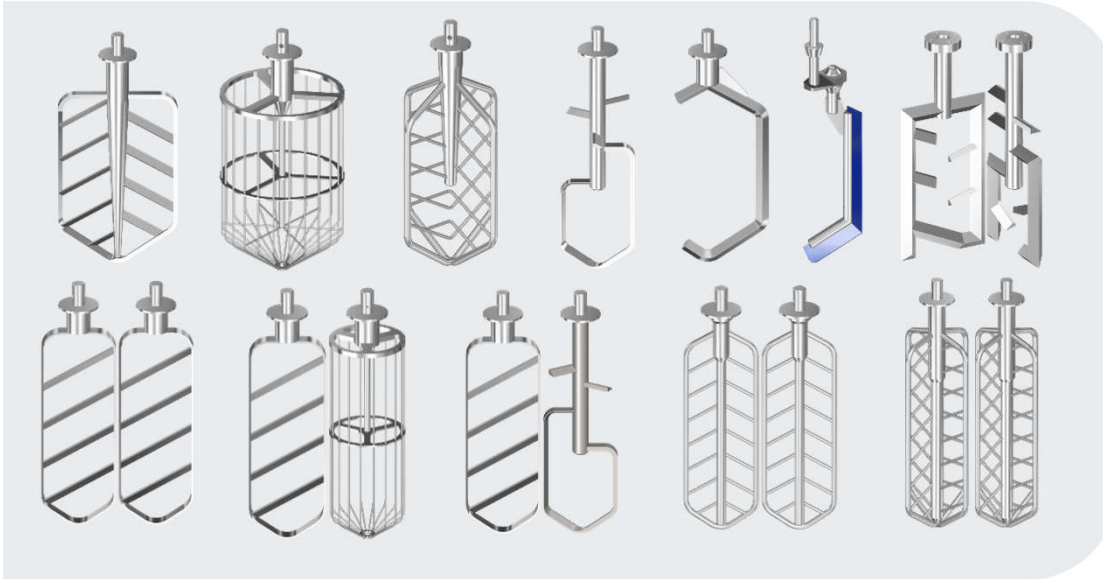


BATTER AERATION CONTROL ON PLANETARY MIXER

● Air incorporation and density change



ULTIMIX – MIXING TOOLS



Tools for a wide range of recipes

Adaptability with its quickly interchangeable tools

2 or even 3 tools → HDPE Scraper in addition to the 2 to

Capability to record up to 99 recipes of 30 phases



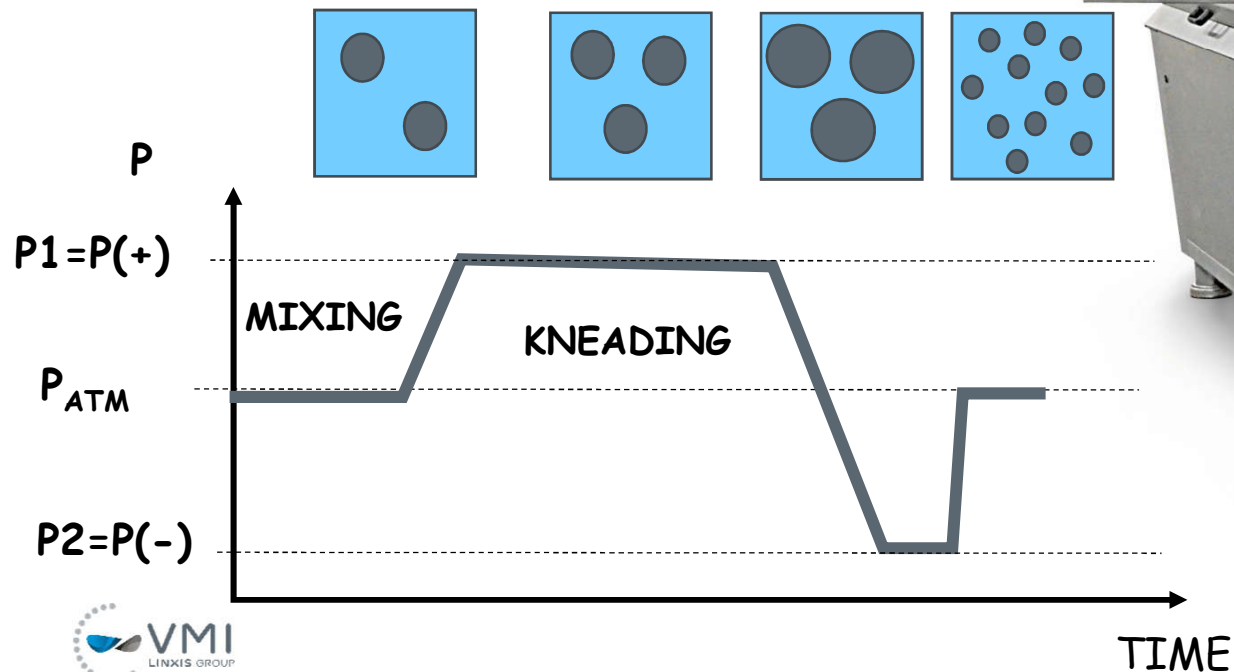
DENSITY
EVOLUTION



MIXING PARAMETERS: AIR BUBBLES INCORPORATION

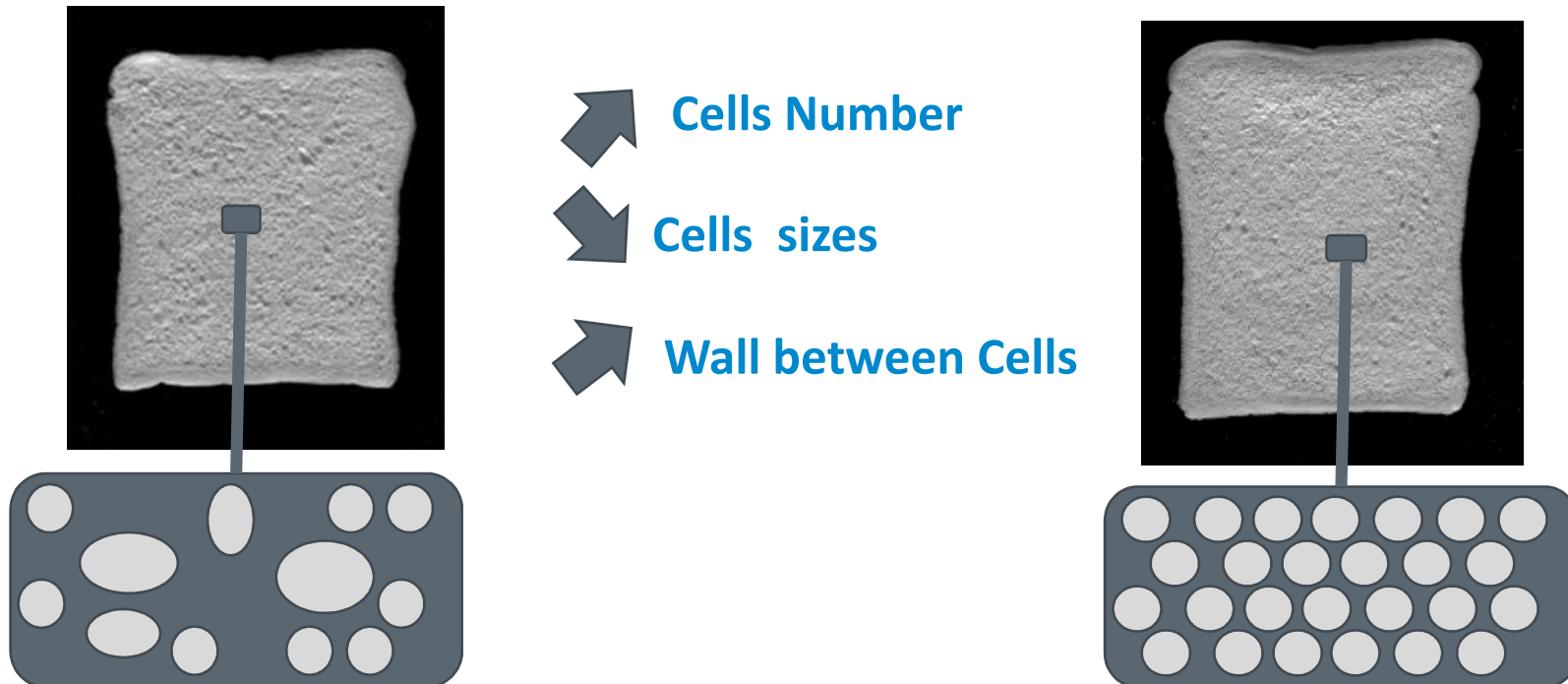
● Pressure/ vacuum applications control

- STRUCTURE
- STEACKINESS
- RHEOLOGY



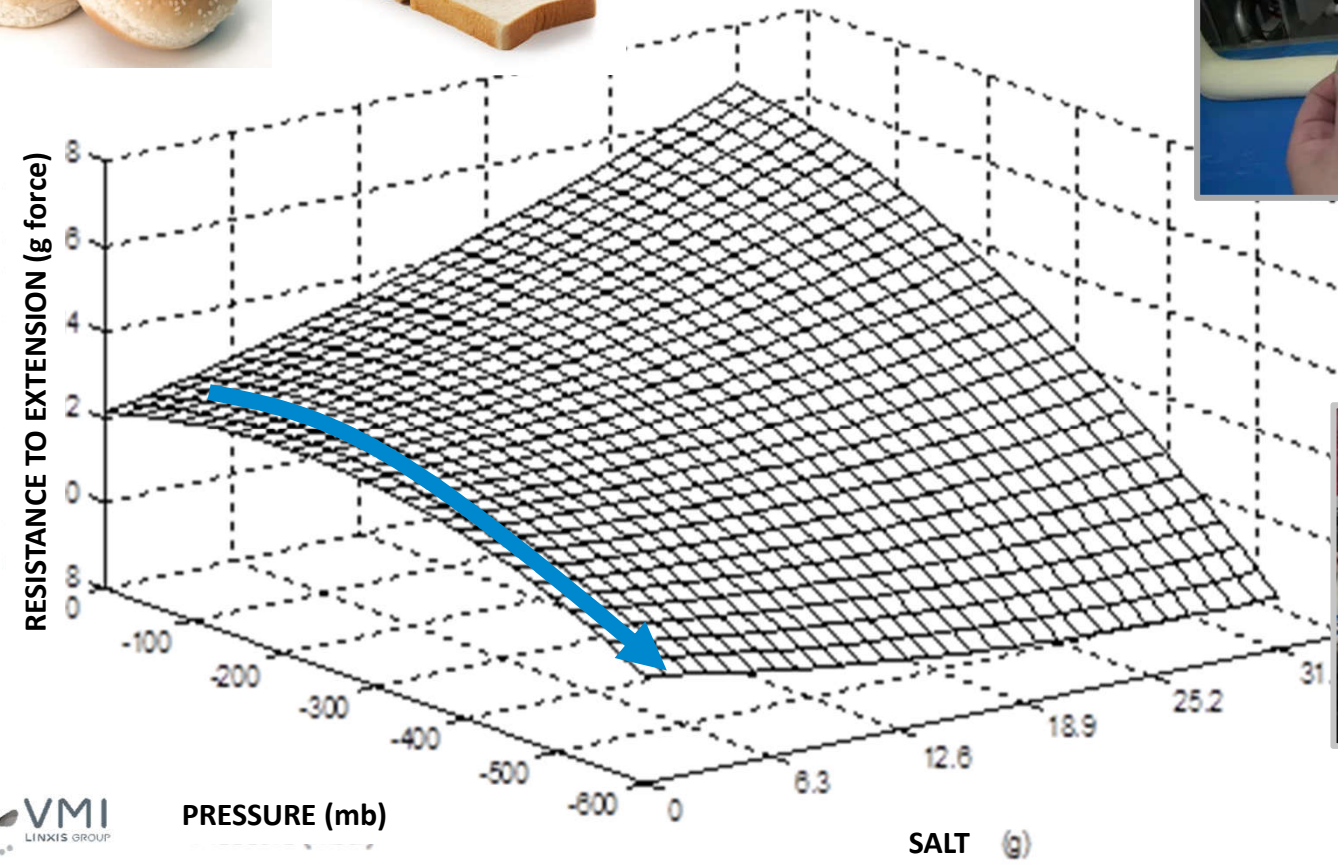
MIXING PARAMETERS: AIR BUBBLES INCORPORATION

- Mixing prepare the final texture of the dough and consequently the after baking



IMPACT OF PRESSURE and SALT on DOUGH EXTENSIBILITY

PRESSURE DURING MIXING = ➔ EXTENSIBILITY of DOUGH



CONTINUUM – product structure and vacuum mixing

INTEREST OF VACUUM MIXING

- Dough quality (stickiness & plasticity)
- Reduction of size of gas nuclei
- Faster start of expansion during baking
- More homogenous gas cell distribution
- Better frozen/thaw quality



NON VACUUM



VACUUM



TO CONCLUDE...

MIXING UNDERSTANDING

***A REAL TOOL
TO BETTER CONTROL
CLEAN LABEL PRODUCTS***



THANKS!

You are welcome at
VMI & in our lab!

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