

Rheo F4

Unique solution to analyze in one single test the dough proofing properties



Summary

1- Introduction

- **Baking is a very complex process**
- **Baking : 3 essential stages**
- **Proofing is a key functional step**

2- Rheo F4 : presentation of the device

- **Principle**
- **How to run a test**
- **Results**

3- Rheo F4 : market target and Rheo F4 advantages

- **Target markets**
- **Advantages**

4- Rheo F4 : key applications

5- Conclusion

Baking is a complex process



Baking is a complex process



Baking – 3 essential stages

1- Mixing / kneading

- **Initiating bread structure**



2- Fermentation / proofing

- **Developing bread structure**

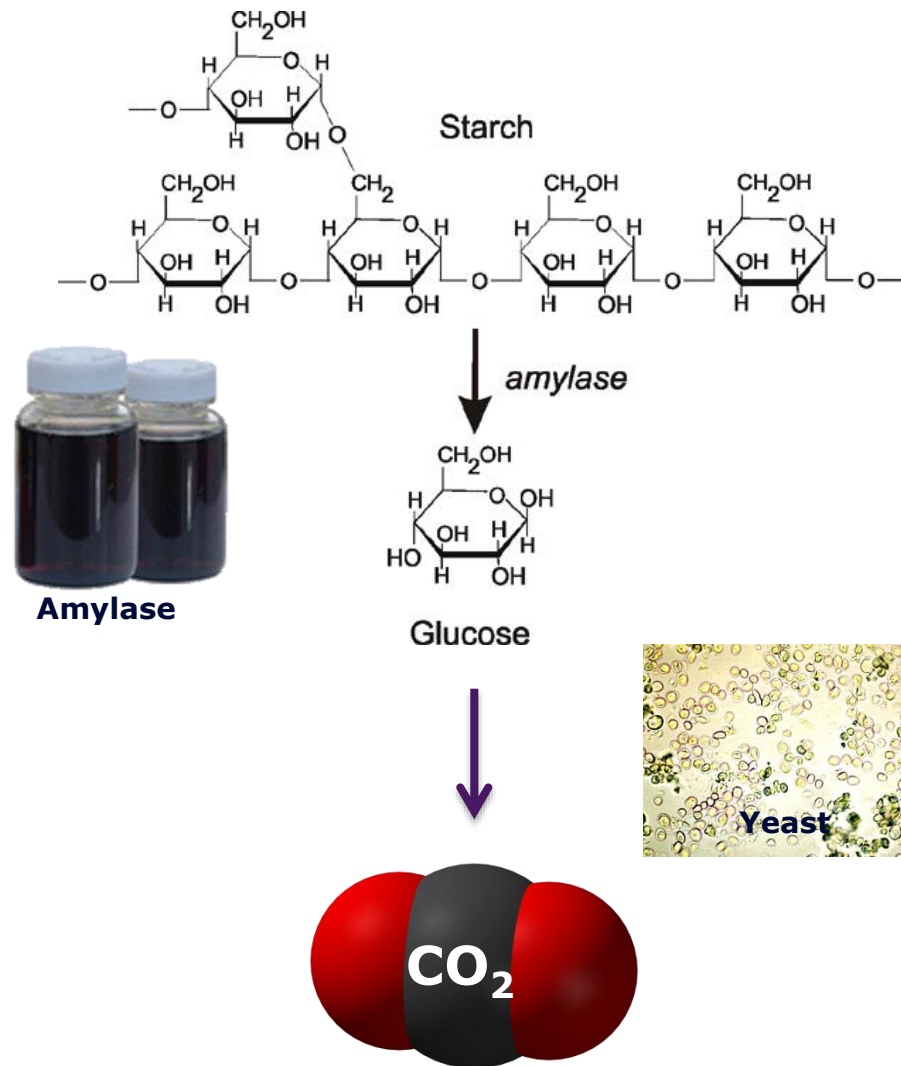


3- Baking

- **Setting bread structure**



Proofing is a key functional step



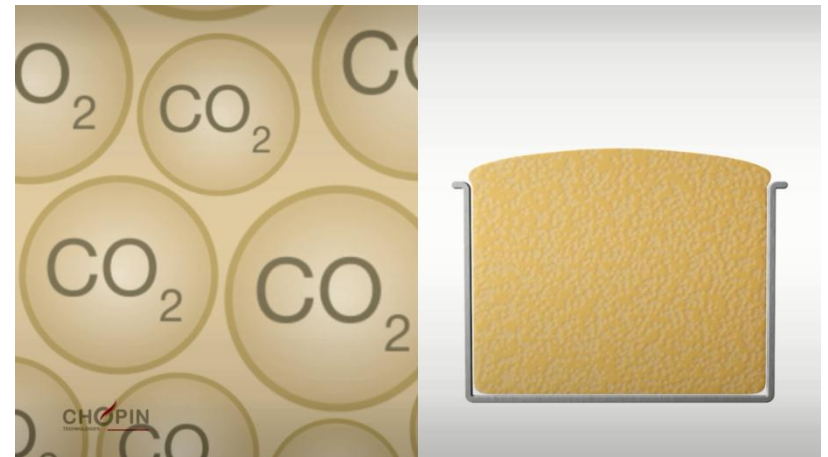
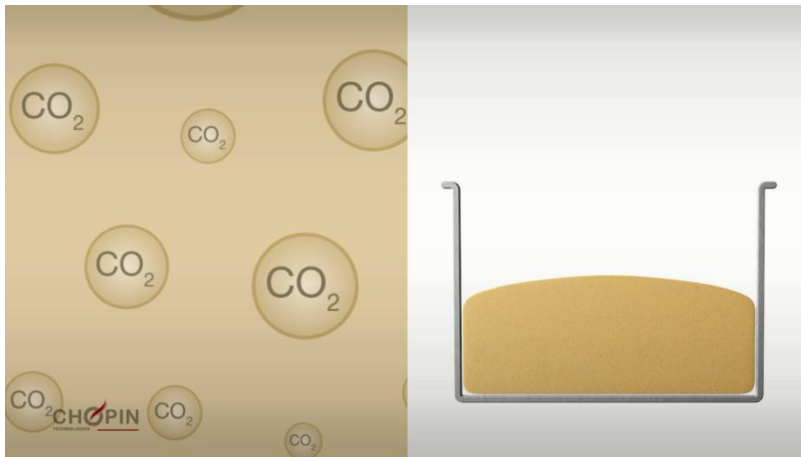
From starch to carbon dioxide

Proofing is a key functional step

CO₂ production
+
CO₂ retention



Dough rising





Proofing is a key functional step

Overall dough proofing performance depends on flour quality, yeast performance and added ingredients.

Gas production depends on :

- **Yeast**
- **Damaged starch**
- **Sugars, enzymes, etc**

Gas retention mainly depends on :

- **Quality of gluten network**

Rheo F4 – Presentation of the device





Rheo F4 –Gas production / retention





Rheo F4 –Dough development



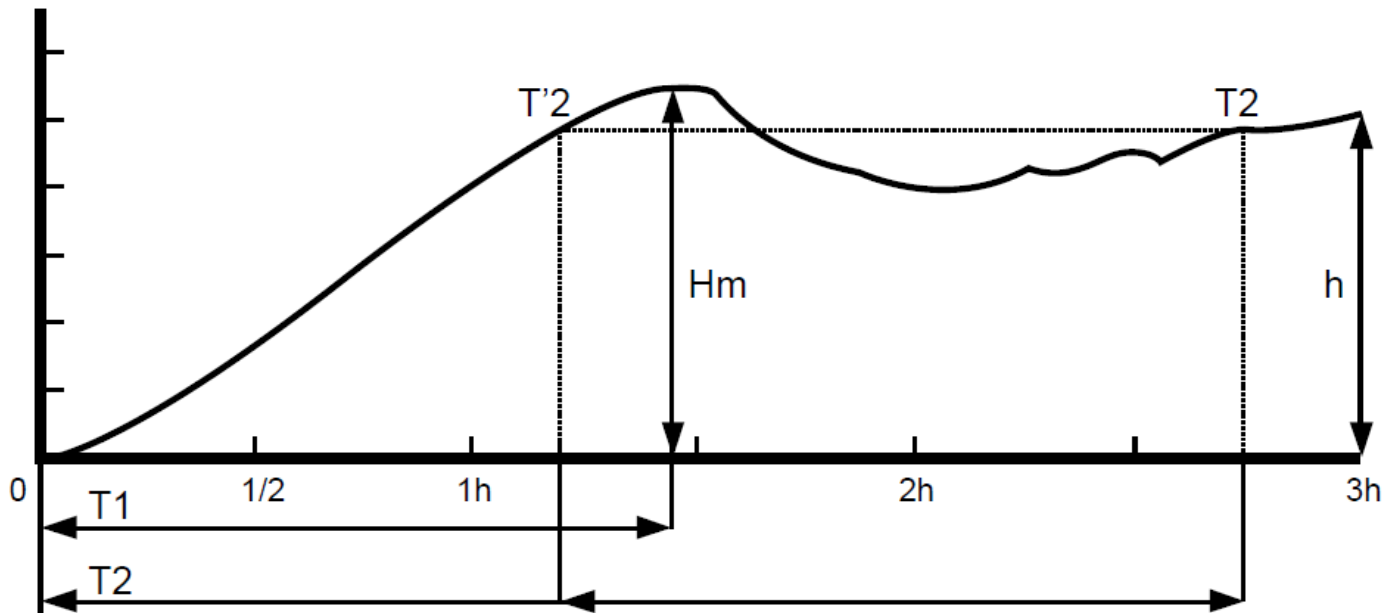


Rheo F4 – CHOPIN standard protocol

- Test temperature: 28.5°C
- Dough composition: 250g of flour, 3g (1.2%) of quick-rising dry yeast (or 7g of baker's fresh yeast), 5g of salt, adapted hydration (based on moisture and "P" value)
- Dough prepared from Alveograph mixer set at 27°C (or repeatable mixer)
- After 1min mixing, 5g of salt is added
- Sample weight: 315g
- Weight applied on the sample: 2kg
- 13min after beginning of mixing, Rheo is started
- Test duration: 3h

IMPORTANT : possibility to customize own protocol

Results from Rheo F4 – Dough development



T1: time to maximum dough development in hours and minutes.

Hm: maximum dough development height under stress, in mm.

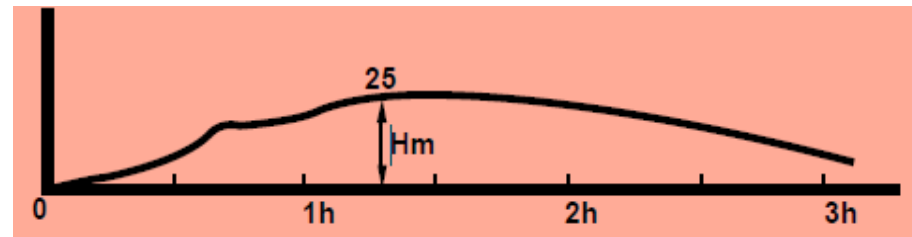
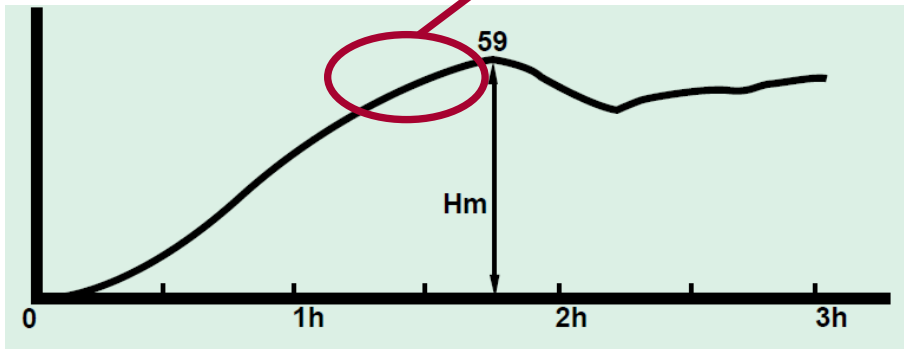
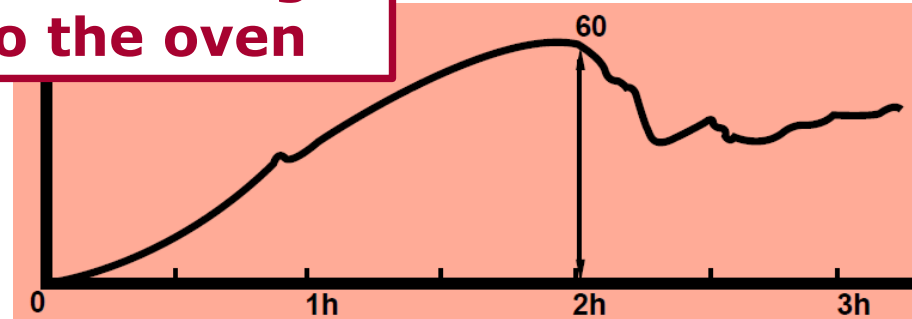
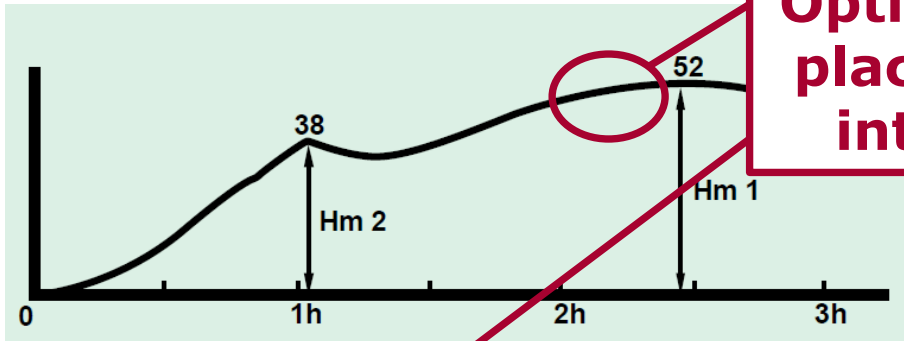
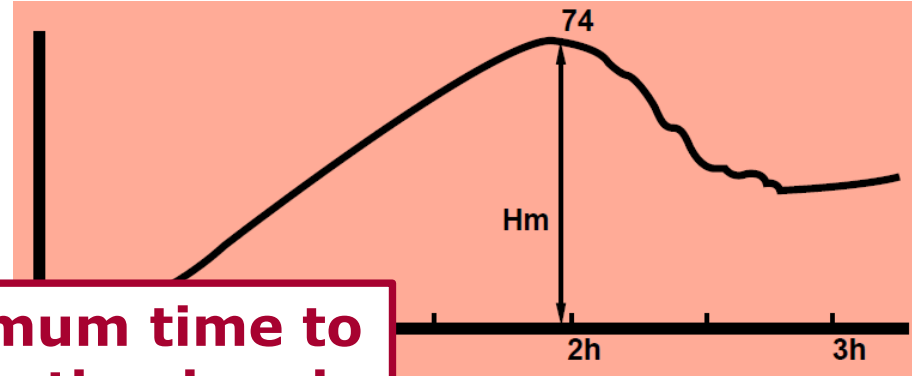
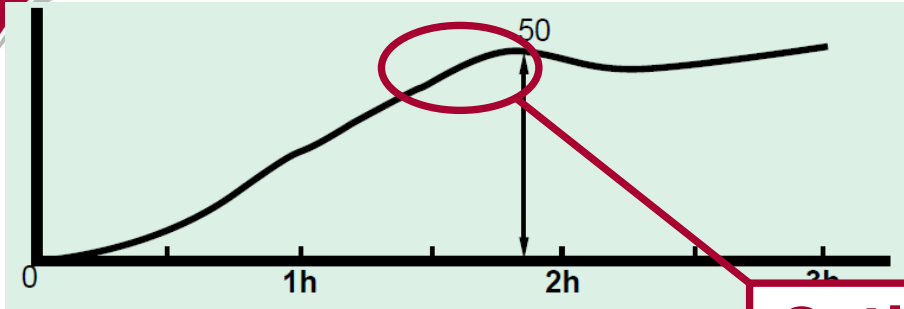
T2 and T'2: relative stabilization time at the maximum point located at a height of $0.88H_m$ without being lower than $H_m - 6\text{mm}$.

$\Delta T_2 = T_2 - T'2$ = dough tolerance during proofing

h: dough development height at the end of the test

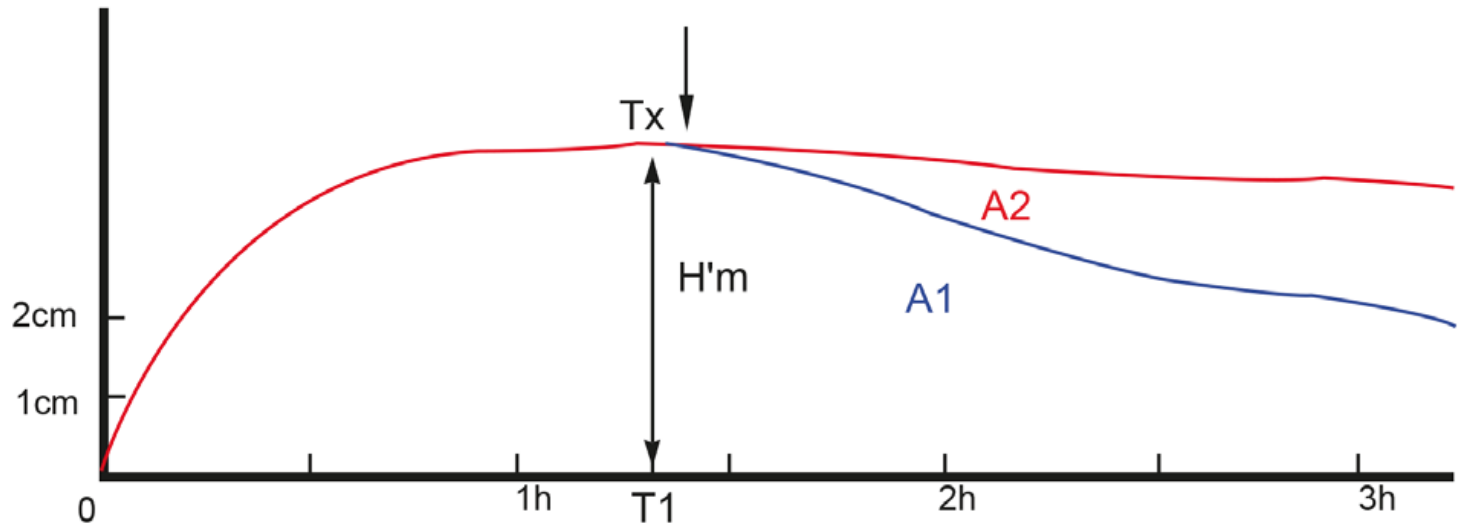
$(H_m - h) / H_m$: % of drop in development after 3h (case of the CHOPIN protocol) compared with T1

Rheo F4 – Example of results



Optimum time to place the dough into the oven

Results from Rheo F4 – Gas release/porosity



H'm: maximum height of the gas release curve.

T1: time required to obtain H'm

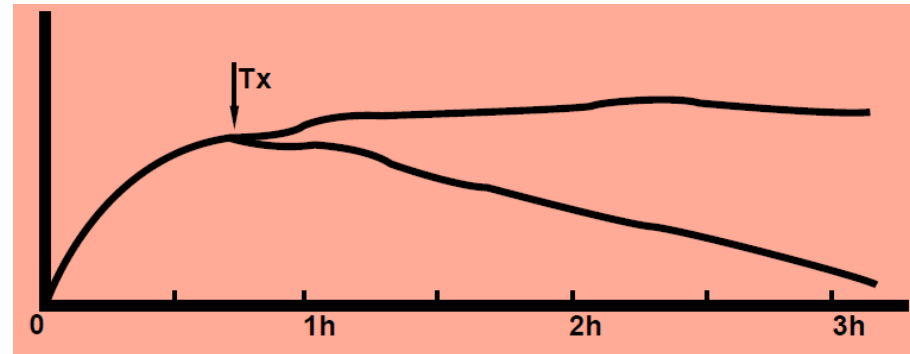
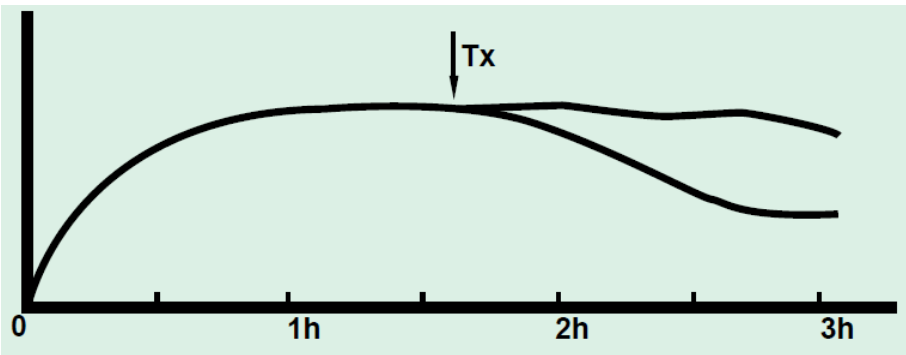
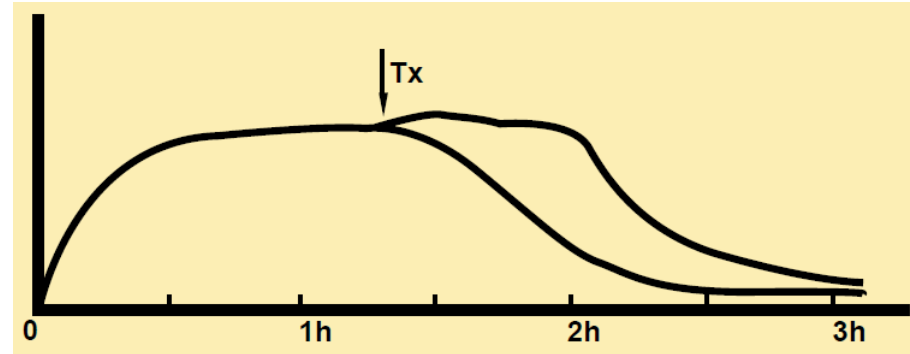
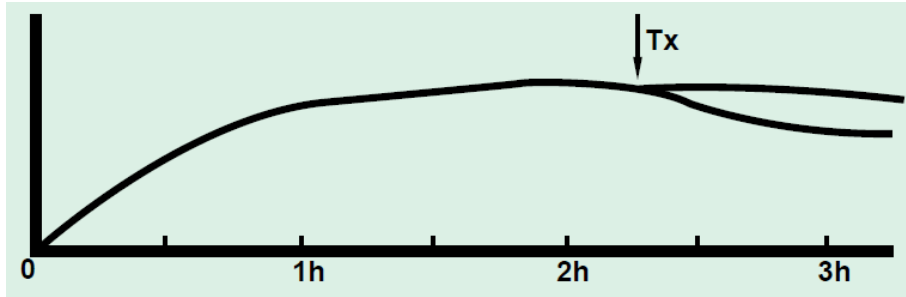
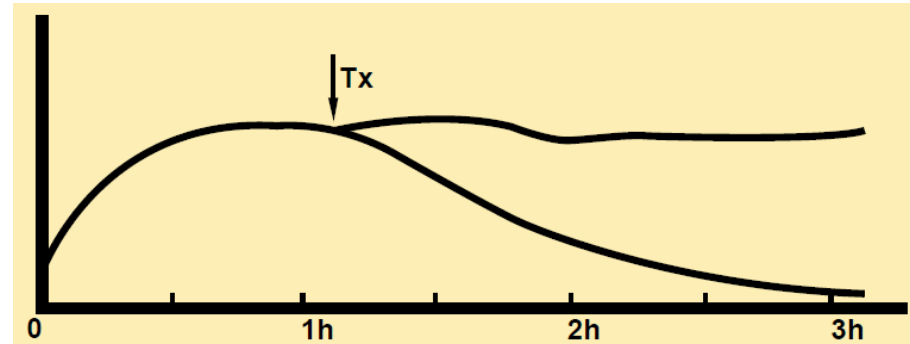
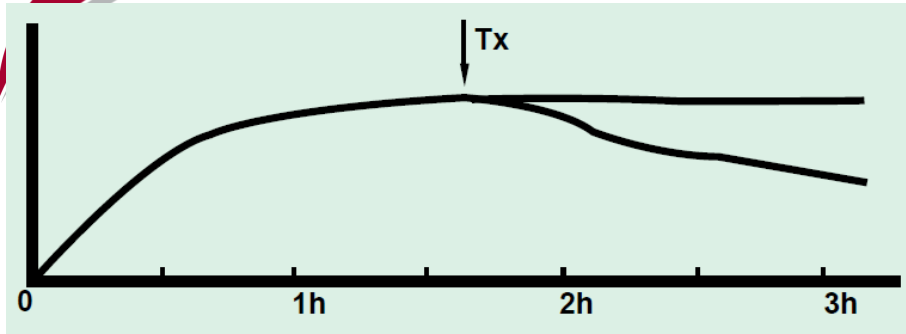
Tx: dough porosity time (**time when the dough starts to lose CO₂**).

Total volume: total volume of gas released in ml (A1+A2 of the curve).

Volume of CO₂ lost: carbon dioxide volume in ml that the dough has lost during proofing (**A2**).

Retention volume: carbon dioxide volume in ml still retained in the dough at the end of the test (**A1**).

Rheo F4 – Example of results



Rheo F4 – The markets

Rheo F4

**Millers
Bakers**

Additives manufacturers

Enzymes manufacturers

Yeast producers

Research Institutes / Universities



CHOPIN
TECHNOLOGIES

CHOPIN
TECHNOLOGIES



Rheo F4 – main advantages

UNIQUE and COMPLETE information in one single test

- Dough development
- Yeast gas production
- Dough porosity / permeability
- Dough tolerance during proofing

SIMPLE

- Total **software control** PC (USB)
- Fully **automated test**: prepare the dough and then let the system manage all analysis
- Results automatically saved
- Automatic **creation of a certificate of analysis**

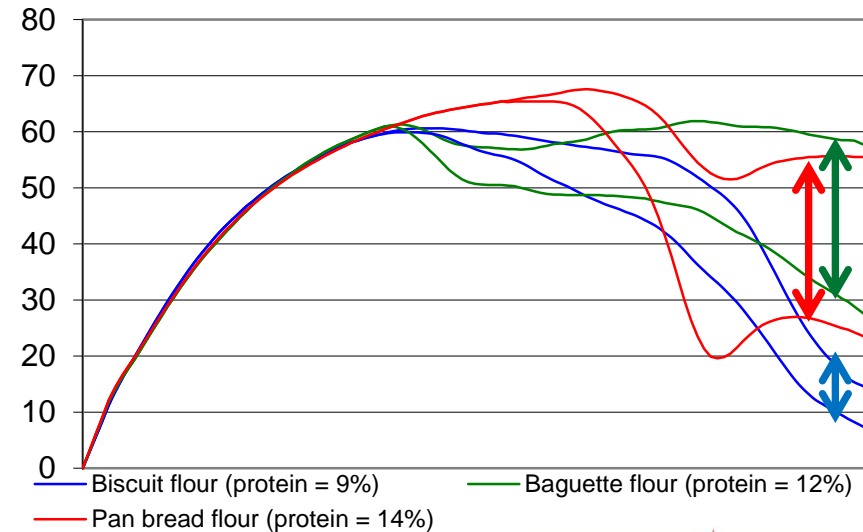
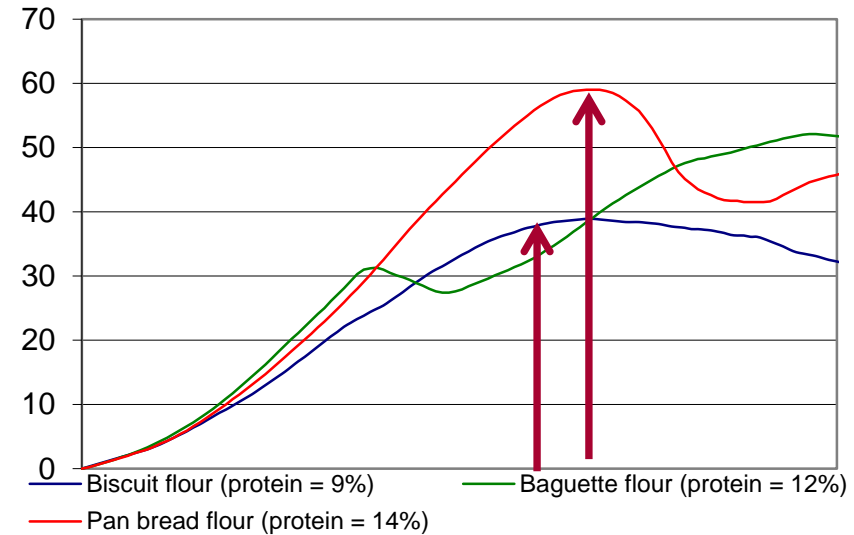
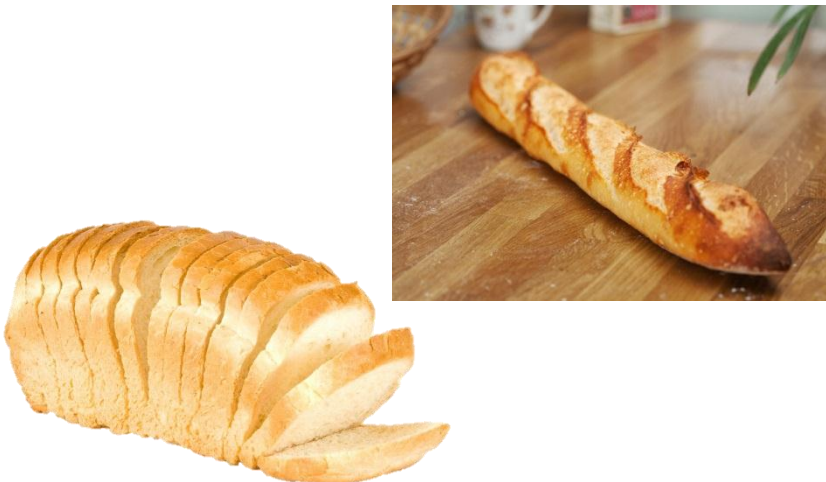
ECONOMIC

- Simple design, **low maintenance**, **only one consumable** (soda lime)

Applications – Different flours

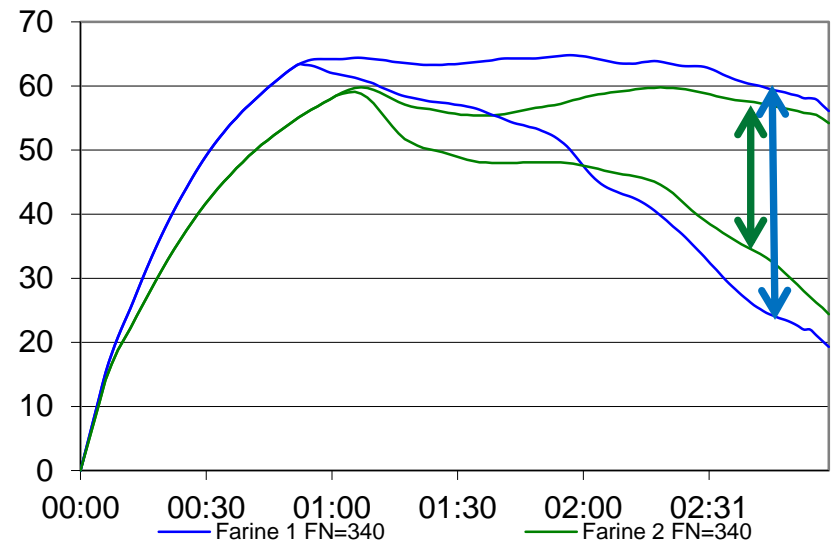
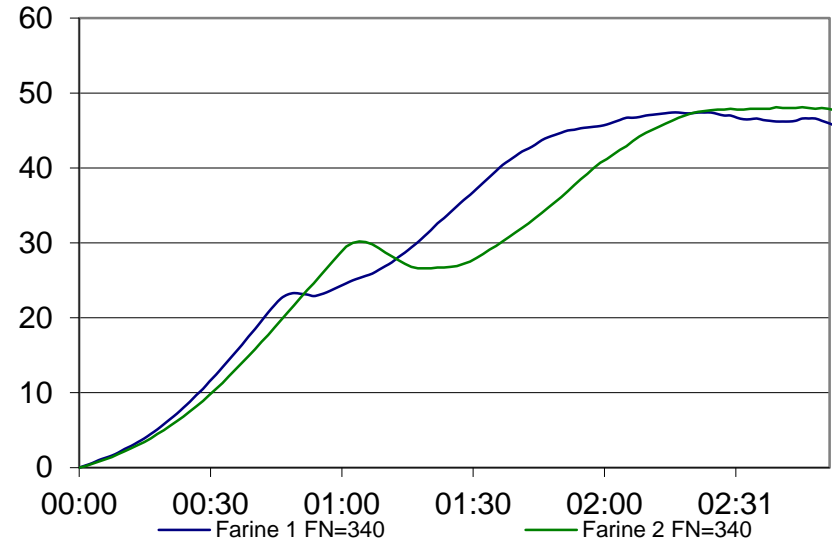
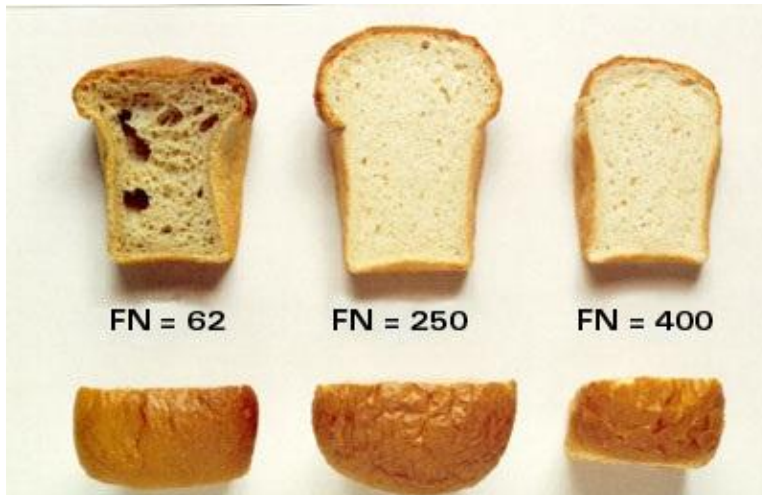
Flours with different protein contents have different behaviors during proofing.

Rheo F4 identifies the optimal properties for every products.



Applications – Flours with same falling number

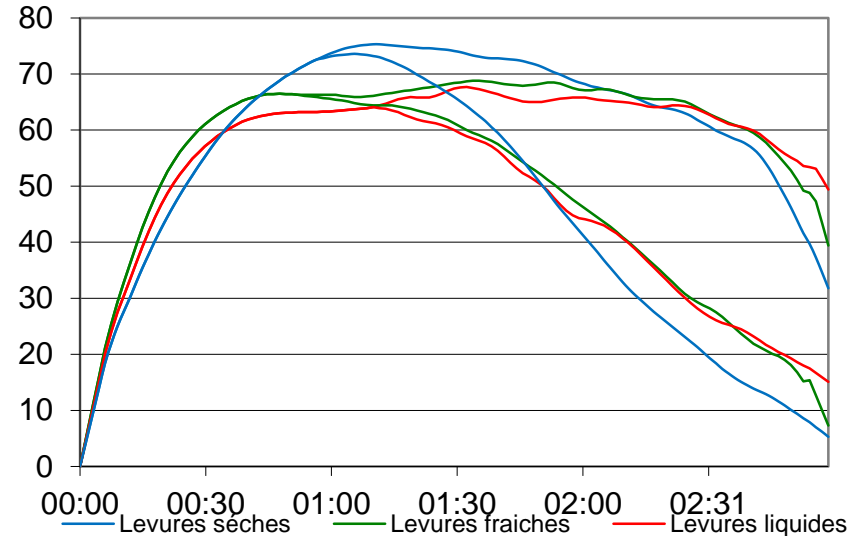
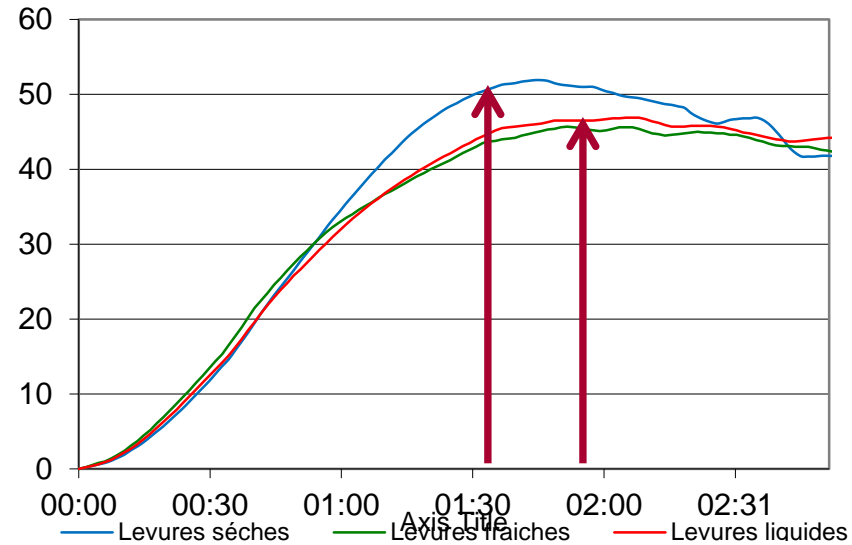
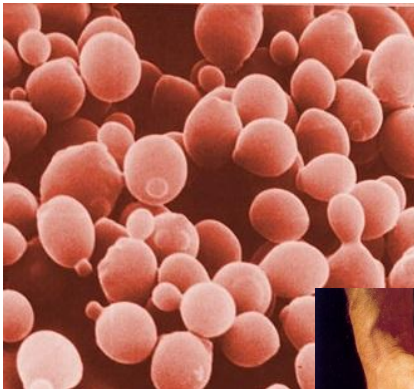
Flours with same falling number can show different results during proofing. For example, flour 2 has higher gas retention. Rheo F4 gives complete and precise results directly related to volume of the final products.



Applications – Yeast activity

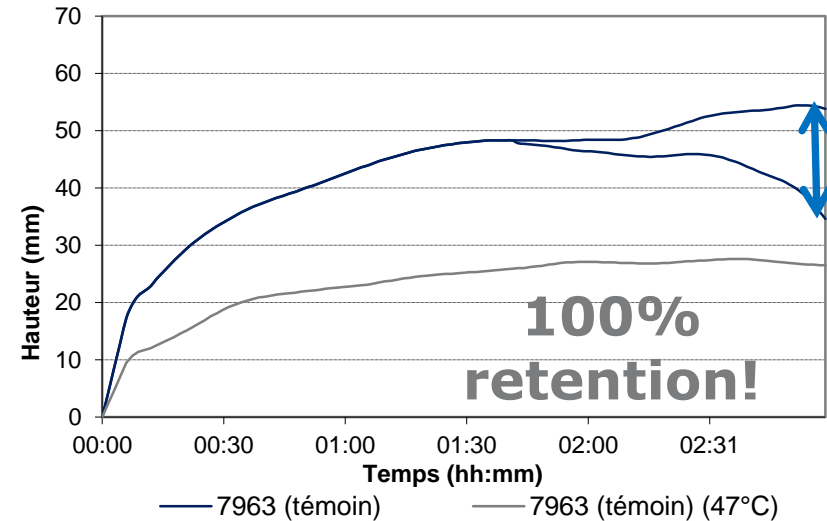
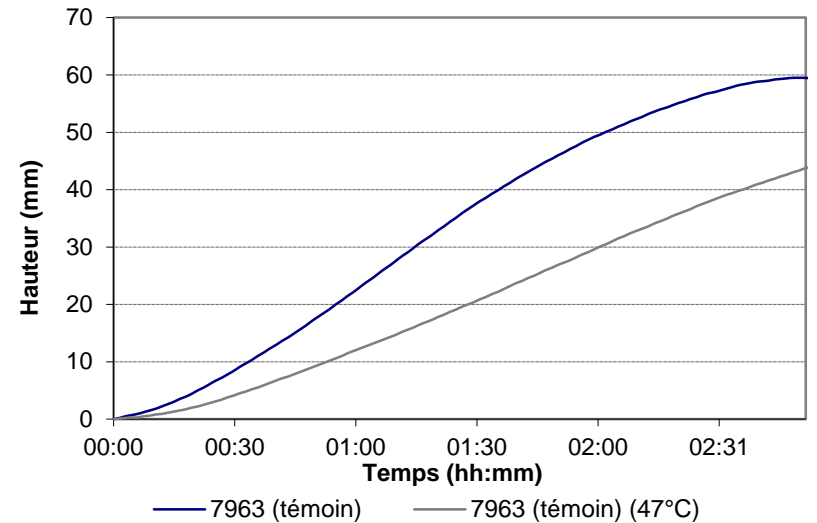
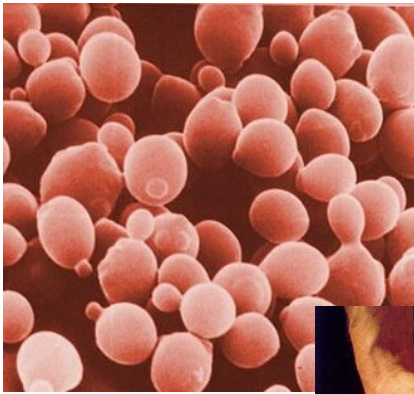
Different types of yeast give different maximum dough development and gas production.

Rheo F4 measures yeast performance in their "real" environment.



Applications – Yeast activity / Aging effect

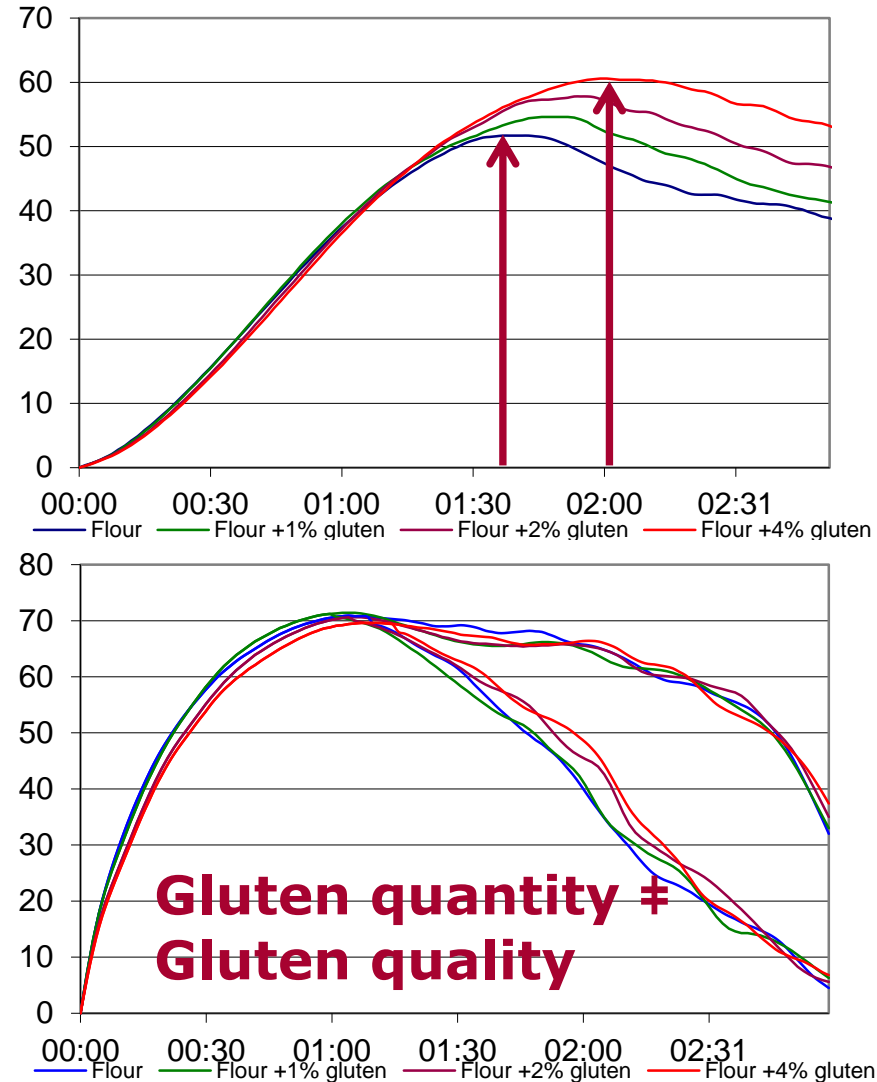
After 1 week at 47°C, yeast show lower dough development and gas production.



Applications – Vital Wheat Gluten

The more VWG added, the stronger dough development.

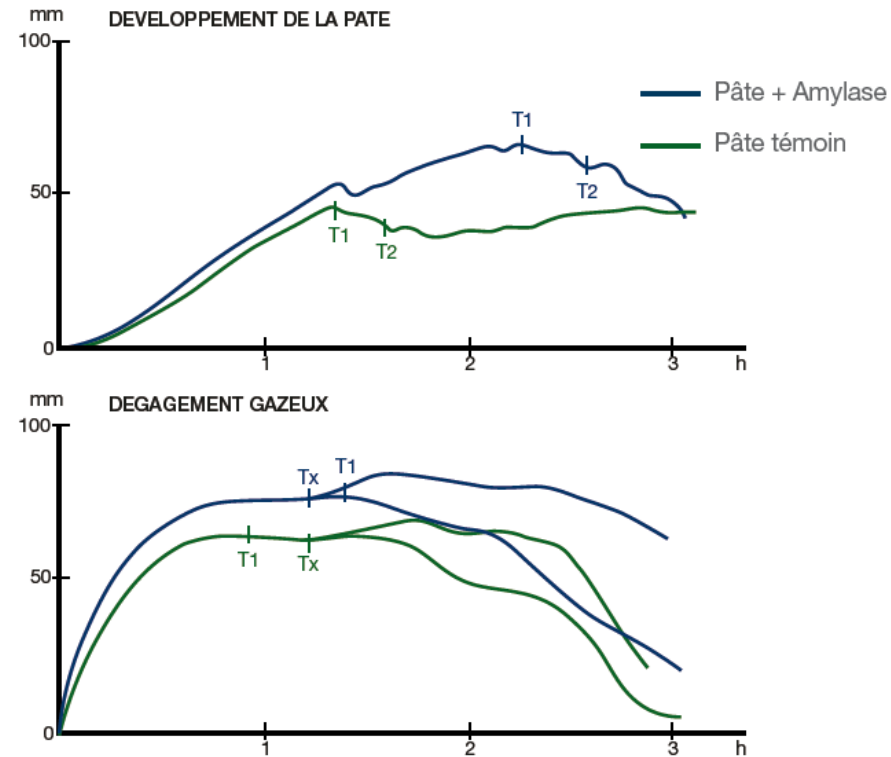
With Rheo F4, adjust precisely the quantity of VWG needed for optimal dough development.



Applications – Alpha amylase

Alpha amylase increase fermentative capacities of dough : **higher dough development and gas production.**

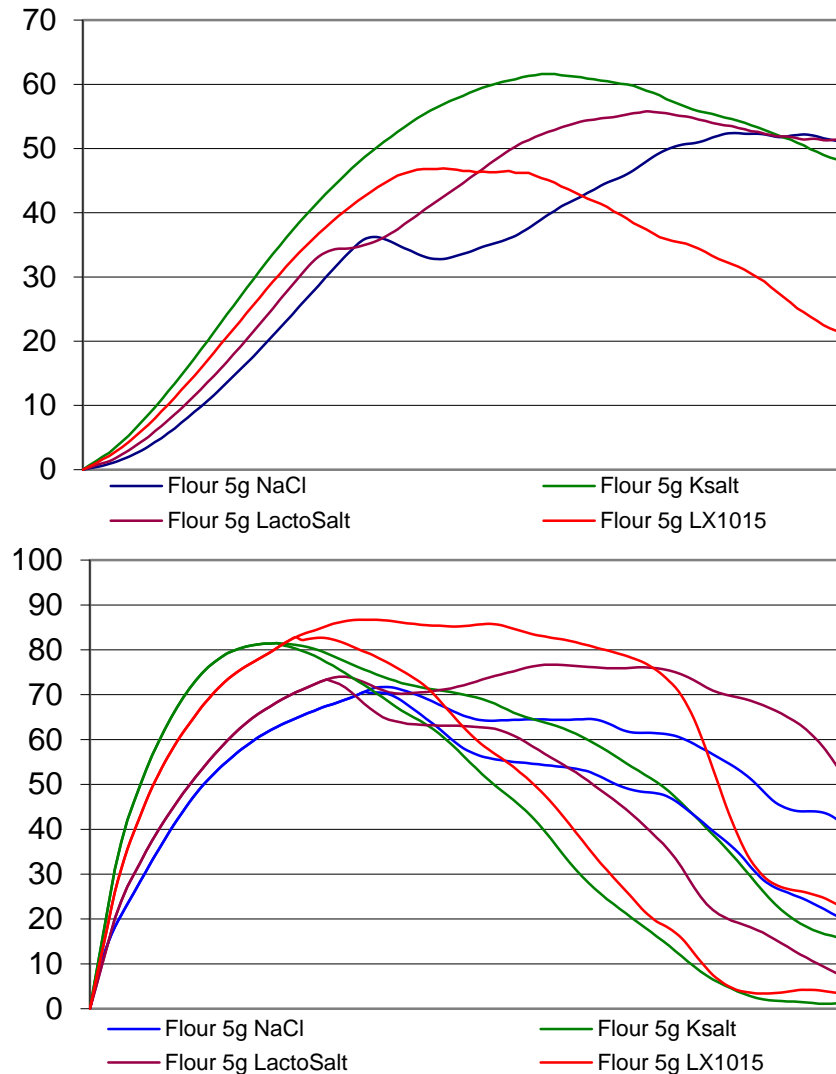
With Rheo F4, identify precisely effects of Alpha amylase on dough behavior.



Applications – Salt substitutes

The different NaCl replacers have very **different and sometimes opposite effects** on dough proofing properties.

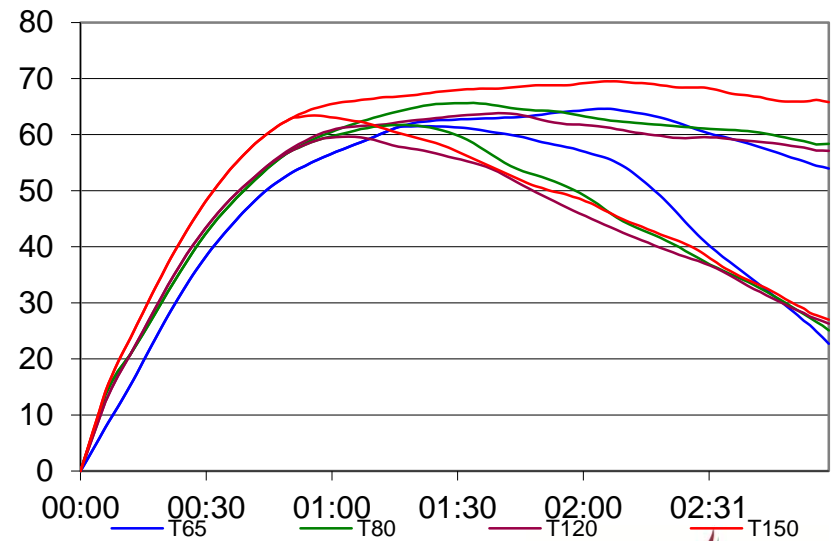
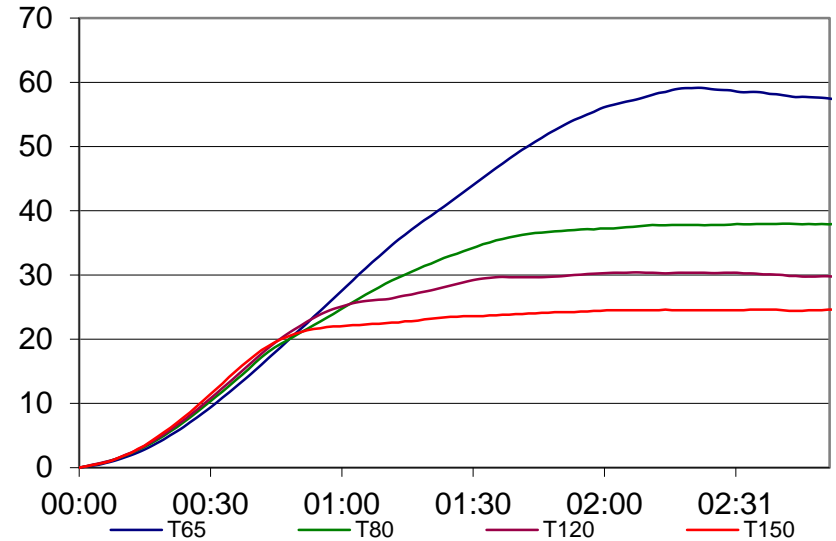
With Rheo F4, anticipate dough behavior and fine tune salt substitutes addition to your formulas.



Applications – High fiber flour

Flours with high fiber/mineral content have **lower dough development and gas retention, and earlier porosity.**

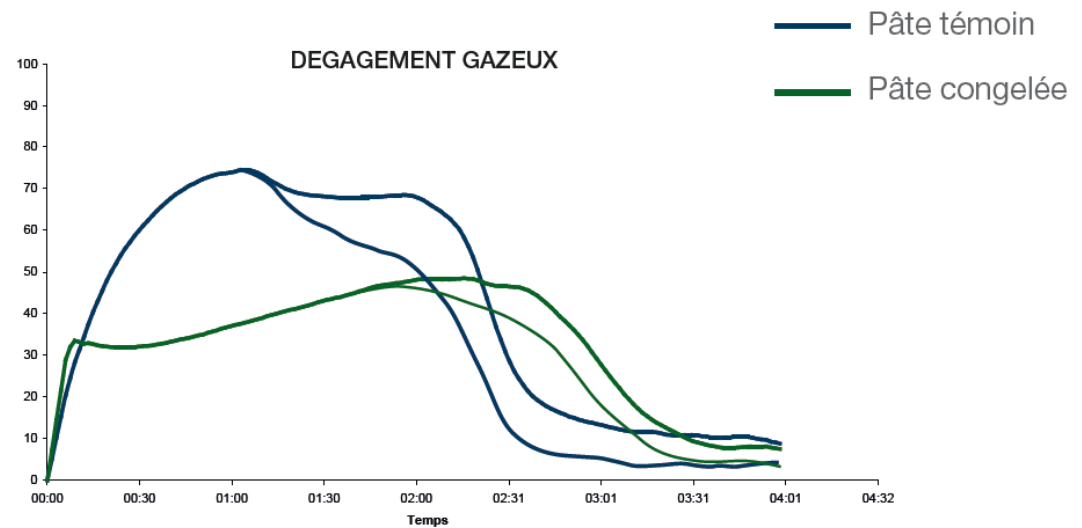
With Rheo F4, optimize high fiber bread formulation.



Applications – Frozen dough

Pre-frozen dough shows **lower gas production** than fresh dough. **Additives may be used to correct this.**

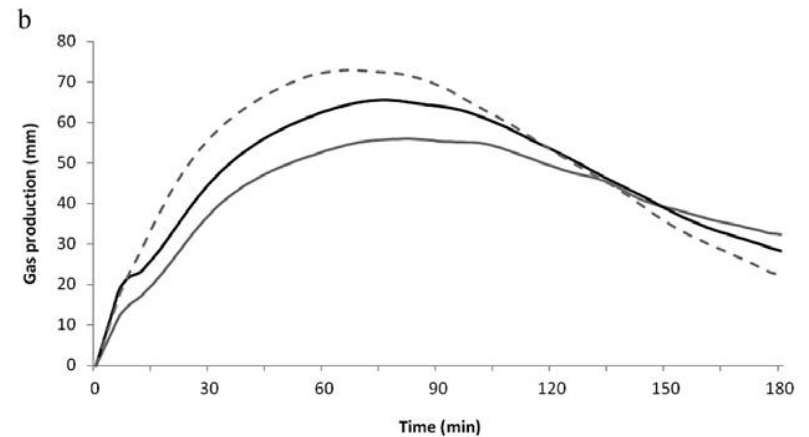
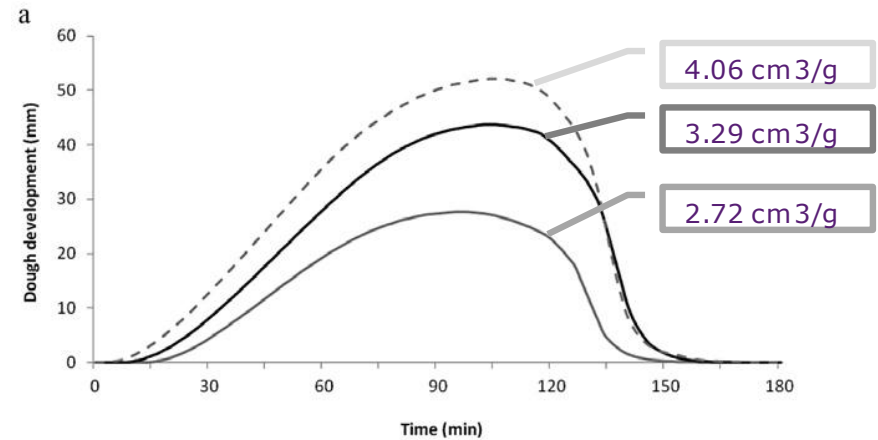
With Rheo F4, evaluate and optimize fermentative performance of pre-frozen dough.



Applications – Gluten free products

Rheofermentometer was used to optimize the mixing stage of a rice-based complete gluten-free formula

→ **Shorter mixing, better volume**



Gomez M., Talegon P., De la Hera E., 2013, influence of mixing on quality of gluten-free bread, *Journal of food quality*, 36:139-145





Conclusion

- **Unique and complete information in one test**
 - Dough development
 - Total gas production
 - Dough porosity / Gas retention
 - Dough tolerance during proofing
- **Easy to use**
 - Automated
 - PC driven
- **Rheo F4 : The Best Solution to Control proofing and ensure correct volume of final products**