

**22nd Annual IAOM Mideast & Africa
District Conference & Expo
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Dead Sea, Jordan**

Recent Developments in Rheological Instruments

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...where quality is measured.

Situation in the laboratory today

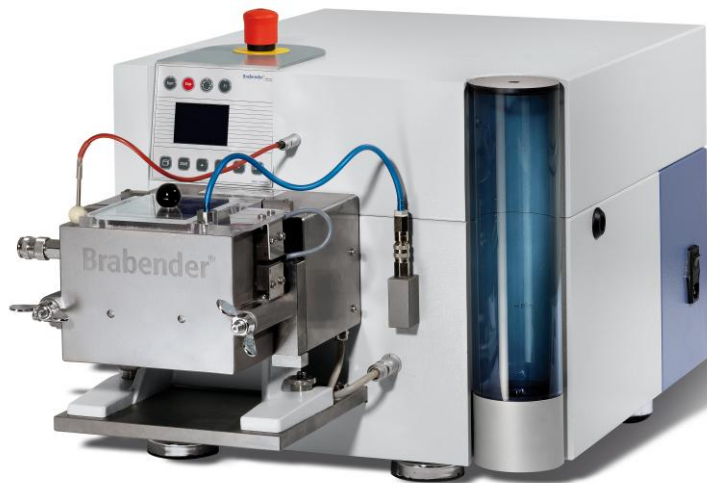
- Many analysis necessary
- Classification of raw materials more and more difficult
- For different materials the current methods are not sufficient
- Little time available
- Sometimes not well-trained laboratory technicians
- Complex test procedures

Solution in the laboratory for the future

- High rate of automation
- New developments of instruments and methods
- Self-controlled working and test processes
- Easy handling of instruments
- Automatic evaluations and statistics

Recent Developments in Rheological Instruments

Farinograph®-AT



Rapid Moisture Tester MT-C



...where quality is measured.

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Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT

The 4th Farinograph® generation



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Features

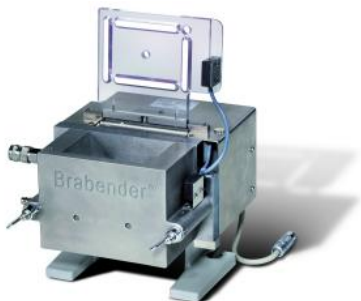
- Automatic water dosing system
- Extended software applications
- Better reproducibility (because of technical innovations)
- Variable speed (0-200 min⁻¹)
- Higher torque (20 Nm)
- Actual temperatures are shown and recorded when needed (mixing bowl, dough and water)
- Calculates mixing energy
- Accuracy water dosing system < 0,1 % of added water

Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT – working tools

Sigma mixer S 300

- Standard test according ICC/AACC e.g.
- 300 g flour
- For mixing the Extensograph dough
- Removable blades



Sigma mixer S 50

- Standard test according ICC/AACC e.g.
- 50 g flour
- Removable blades



Sigma mixer S 10

- For small samples
- 10 g flour
- For breeders and research work
- To mix dry gluten



Resistograph mixer R 100

- Flat blades
- Narrow bowl
- Intensive/high speed mixing
- High shearing force



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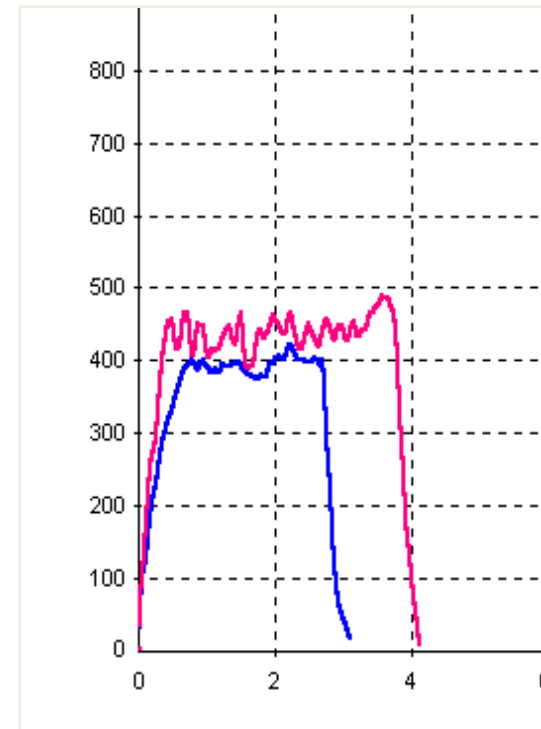
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Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT – working tools

Hardness and Structure Tester

- Measures hardness of grain (wheat, barley, malt)
- Torque and time during milling with a cone mill is recorded.
- Gives information about the need of conditioning of grain
- Adjustable fineness
- Special software



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Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT – working tools

Planetary mixer P600

- Soft dough (e.g. rye doughs)
- Sponges (e.g. sponge batters)
- Foames (e.g. egg white)
- Cold swelling raw materials
- Container volume: 2500 ml
- Temperature controlled:
approx. minus 5 → 150°C



Farinograph®-E with P600



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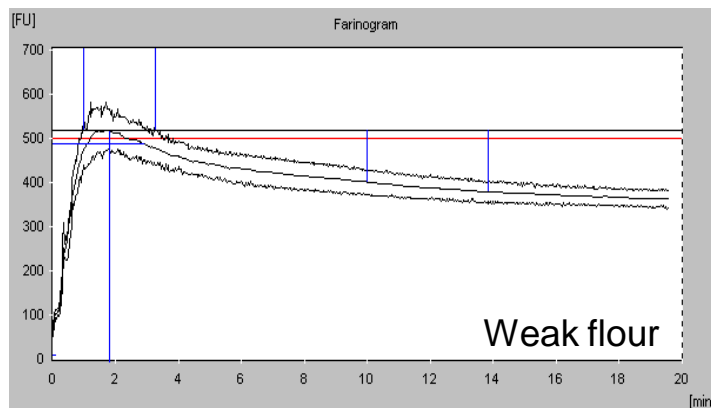
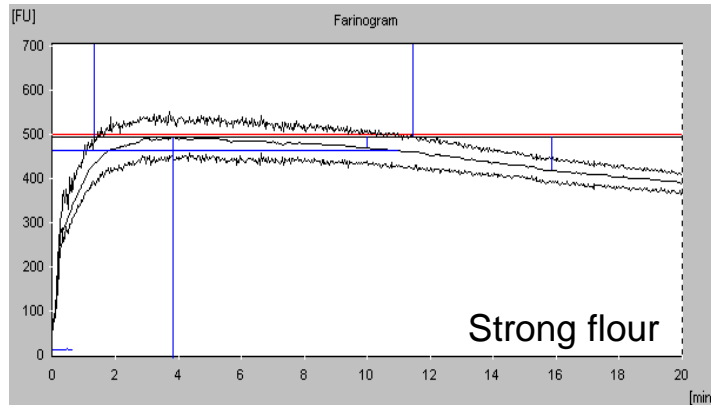
Software options

1. **Standard software to run standard test like ICC or AACCC**
2. **Additional software for different applications beside the standard Farinograph® test**

Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT – software options

Software to run standard test like ICC, AACC



Information about

- Wheat quality
- Water absorption
- Mixing behaviour
 - Development time
 - Stability
 - Degree of softening

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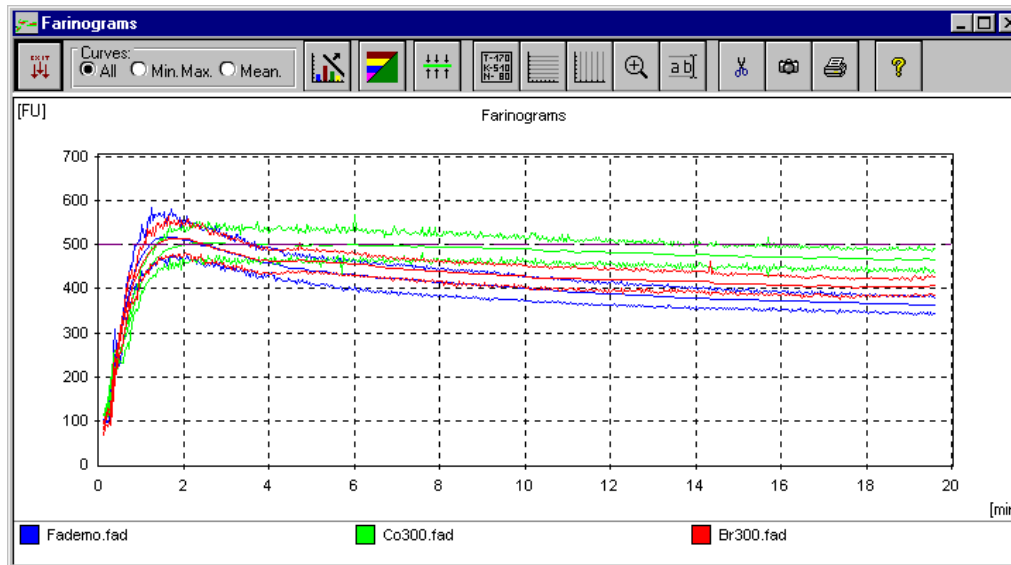
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Recent Developments in Rheological Instruments

Brabender® Farinograph®-AT – software options

Automatic correlation of different curves

- to compare different curves
- to get statistical evaluation



| Parameter | Fademo.fad | Co300.fad | Br300.fad |
|---------------------------|----------------------------------|---------------|---------------|
| Sample | Biscuit ABC | CO | BR |
| Date | 10.08.97 | 06.08.97 | 21.08.97 |
| Evaluation | BRABENDER / ICC | BRABENDER/ICC | BRABENDER/ICC |
| Operator | Miller | Serway | Serway |
| Mixer [g] | | 300 | 300 |
| Moisture content [%] | | 13,0 | 14,0 |
| with waterabsorption [%] | | 56,7 | 62,4 |
| Std. Moisture content [%] | | 14,0 | 14,0 |
| Std. Consistency [FU] | | 500 | 500 |
| Remarks | For Best-Cake Compar in Milltown | | |

| | Fademo.fad | Co300.fad | Br300.fad |
|--------------------------------|------------|-----------|-----------|
| Consistency [FU] | 516 | 504 | 512 |
| Waterabsorption (500 FU) [%] | 57,1 | 62,5 | 57,5 |
| Waterabsorption (14,0%) [%] | 55,9 | 62,5 | 57,5 |
| Development time [min] | 1,8 | 2,8 | 2,1 |
| Stability [min] | 2,3 | 12,0 | 2,1 |
| Degree of softening [FU] | 116 | 14 | 83 |
| Degree of softening (ICC) [FI] | 137 | 30 | 96 |
| Farinograph quality number | 29 | 147 | 32 |

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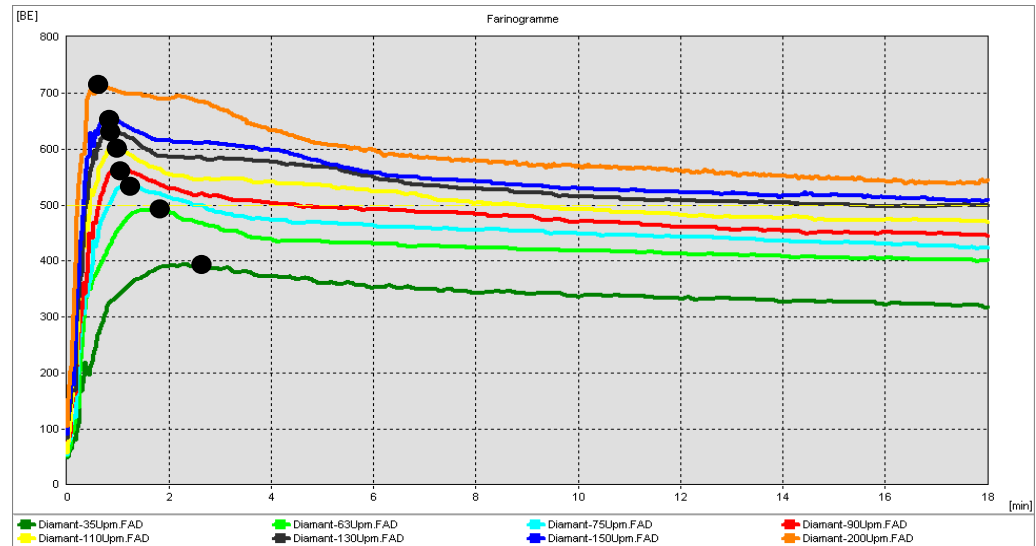
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Brabender® Farinograph®-AT – software options

Variable speed

- Internal method
- Shorten or extend the test time
- Show the influence of intensive mixing
- Considered special product characteristics



| | IBIS-35 | IBIS-50 | IBIS-63 | IBIS-75 | IBIS-90 | IBIS-110 | IBIS-130 | IBIS-150 | IBIS-200 |
|-----------------------------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| Konsistenz [BE] | 401 | 460 | 504 | 536 | 583 | 641 | 694 | 740 | 833 |
| Wasseraufnahme (500 BE) [%] | 59,2 | 60,7 | 61,8 | 62,6 | 63,8 | 65,2 | 66,6 | 67,7 | 70,0 |
| Wasseraufnahme (14,0%) [%] | 59,2 | 60,7 | 61,8 | 62,6 | 63,8 | 65,2 | 66,6 | 67,7 | 70,0 |
| Teigentwicklungszeit [min] | 3,8 | 3,2 | 2,6 | 6,8 | 5,2 | 3,6 | 3,0 | 2,3 | 1,7 |
| Stabilität [min] | 18,6 | 18,6 | 16,0 | 10,9 | 6,5 | 3,5 | 2,4 | 1,6 | 0,8 |
| Teigerweichung [BE] | 24 | 28 | 15 | 18 | 42 | 74 | 103 | 127 | 189 |
| Teigerweichung (ICC) [BE] | 36 | 31 | 28 | 55 | 71 | 90 | 121 | 149 | 199 |
| Farinograph Qualitätszahl | 121 | 107 | 157 | 125 | 85 | 56 | 41 | 32 | 22 |

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Brabender® Farinograph®-AT – software options

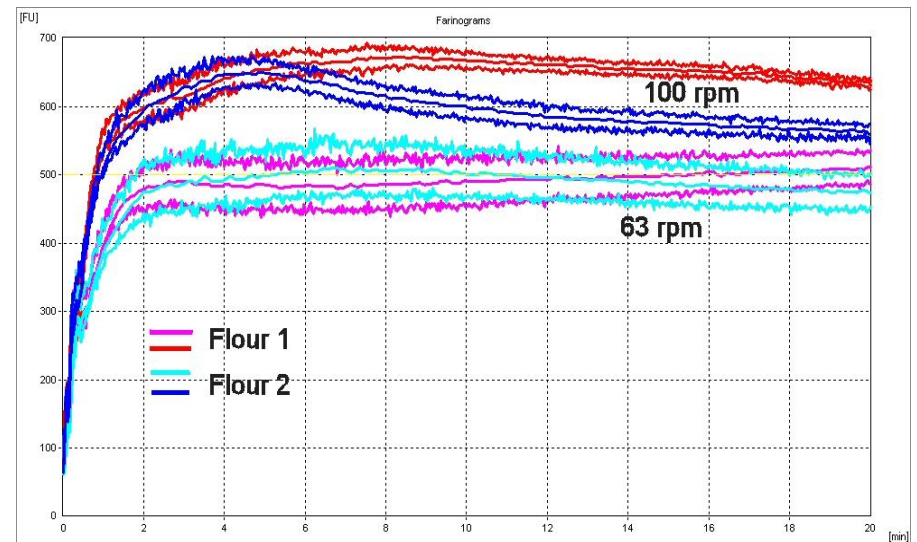
Different kneading intensities

Standard speed 63 min⁻¹

- Both flours have nearly the same quality
- Problems in the production of bread, rolls, toast...,
⇒ But why?

Intensive mixing 100 min⁻¹

- More energy into the dough
- More stress for the gluten
- The gluten of the blue sample crashed after a certain time



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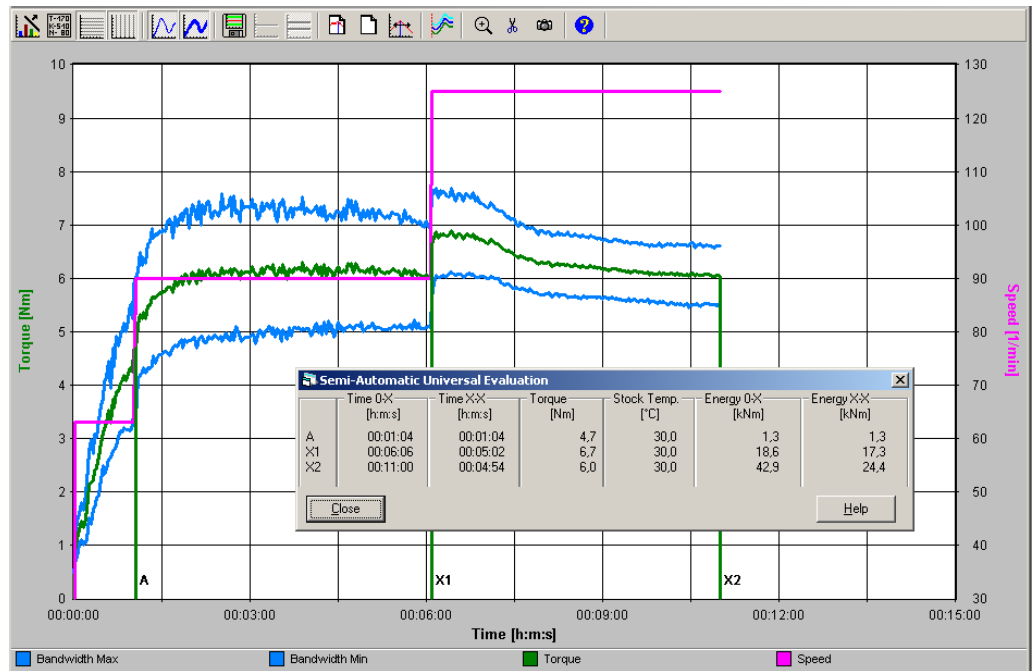
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Brabender® Farinograph®-AT – software options

Programming of automatic speed profiles

For the simulation of the production processes

- 1 minute 63 min⁻¹
- 5 minutes 90 min⁻¹
- 4 minutes 125 min⁻¹



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Special applications

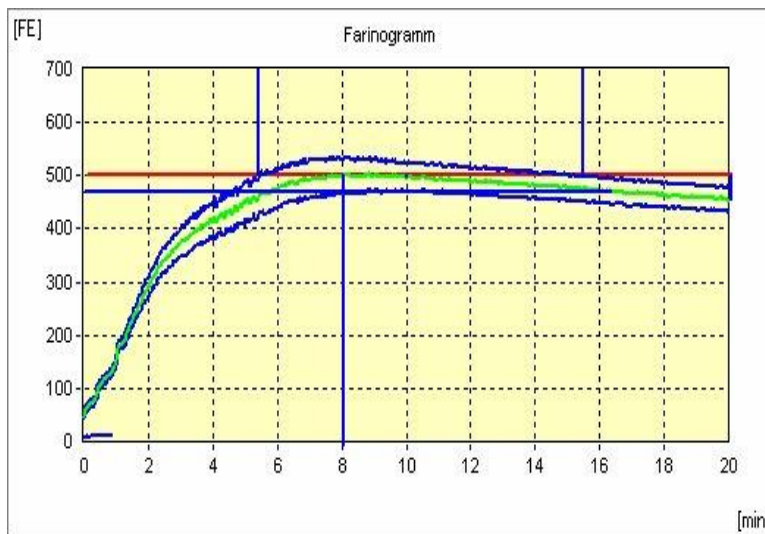
- Wholemeal flour
- Water absorption of rye
- Sponge dough/batters
- Adaption to production process
- Special test profiles (e.g. temperature setting)
- ...

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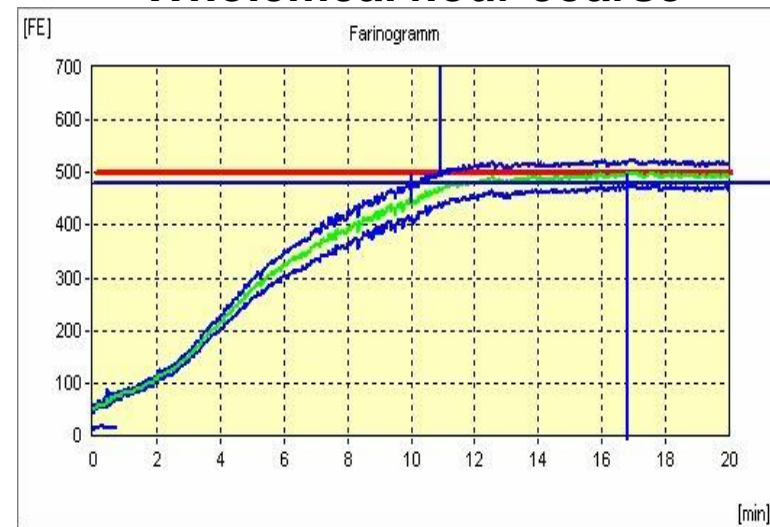
Brabender® Farinograph®-AT – special applications

Results with same dough consistency (500 FU)

Wholemeal flour fine



Wholemeal flour coarse



| | | |
|------|------------------------------|------|
| 65,4 | Water absorption [%] | 63,0 |
| 501 | Consistency [FU] | 498 |
| 8,1 | Dough development time [min] | 16,8 |

...where quality is measured.

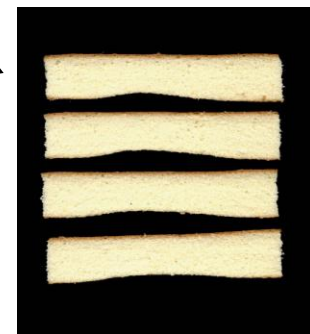
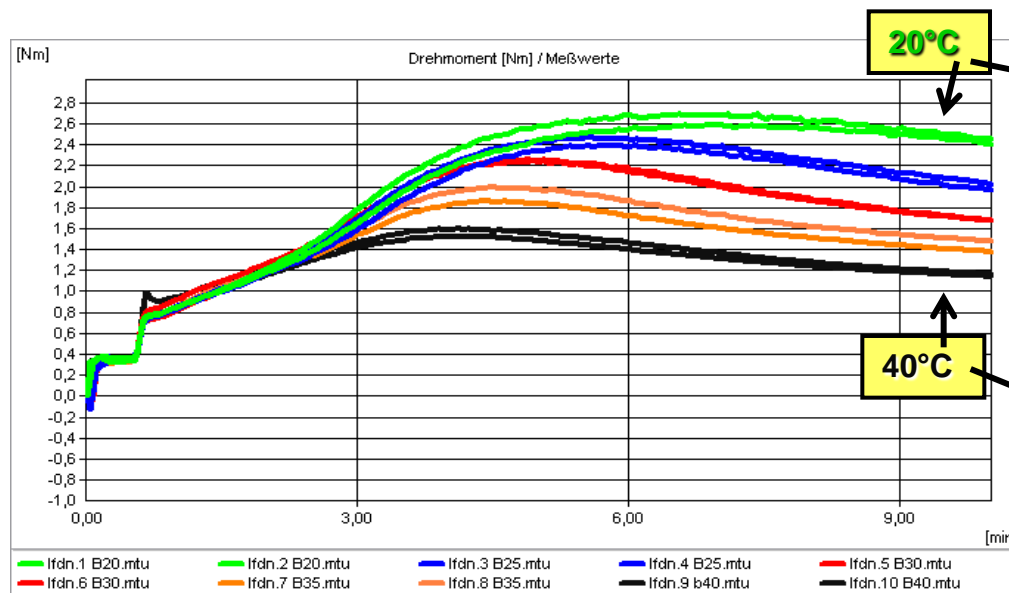
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Brabender® Farinograph®-AT – special applications

Rheological analysis of sponge batters

- 0.5 slow only for mixing
- 9.5 min. fast whipping



The temperatures were increased step by step by 5°C

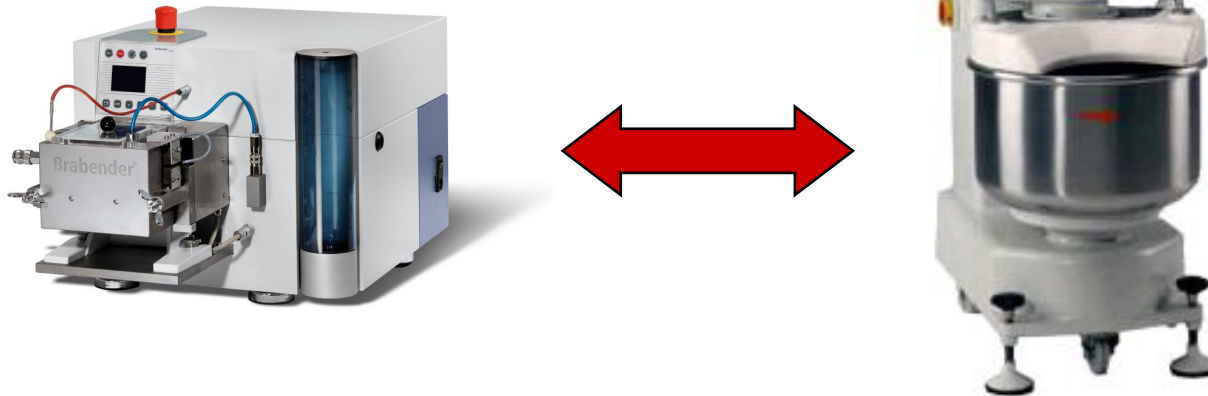
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Brabender® Farinograph®-AT – special applications

**Adaption of Farinograph® results
to the process mixer and the production line**



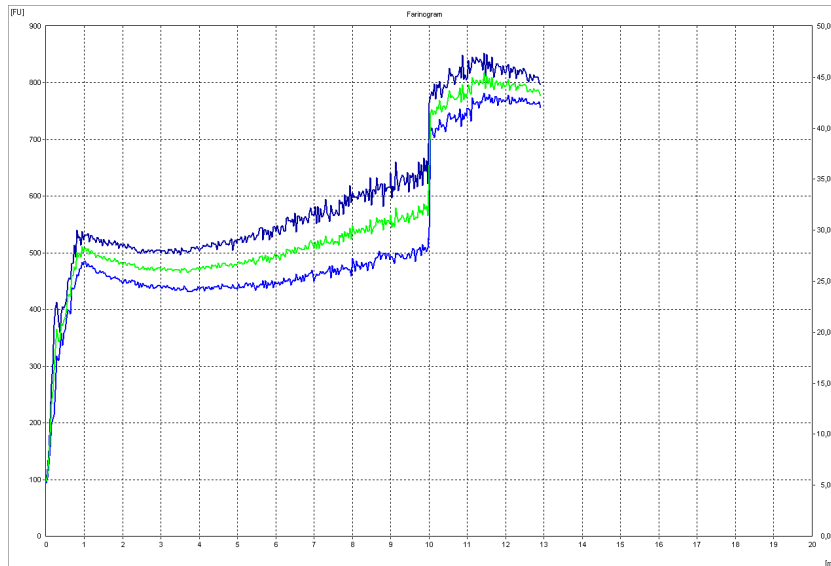
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Brabender® Farinograph®-AT – special applications

Mixing with different speed and all parts of the production recipe (yeast, sugar, fat,..)



- Slow speed (10 min.)
- High speed (product dependent)
- Measuring of energy input
- Verification
- ➔ **Transfer into daily work**

...where quality is measured.

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Benefits for the daily practice

With consideration of

- used raw materials (complete recipe)
 - machines in the production
 - baking product (rolls, bread, puff pastry, ...)
- **Optimization** of water absorption → more water
 - **Adaptation** of the kneading process on raw materials and production facilities → perfect dough
 - **High quality** baking products → satisfied customers
 - **Less loss** through non-sellable products

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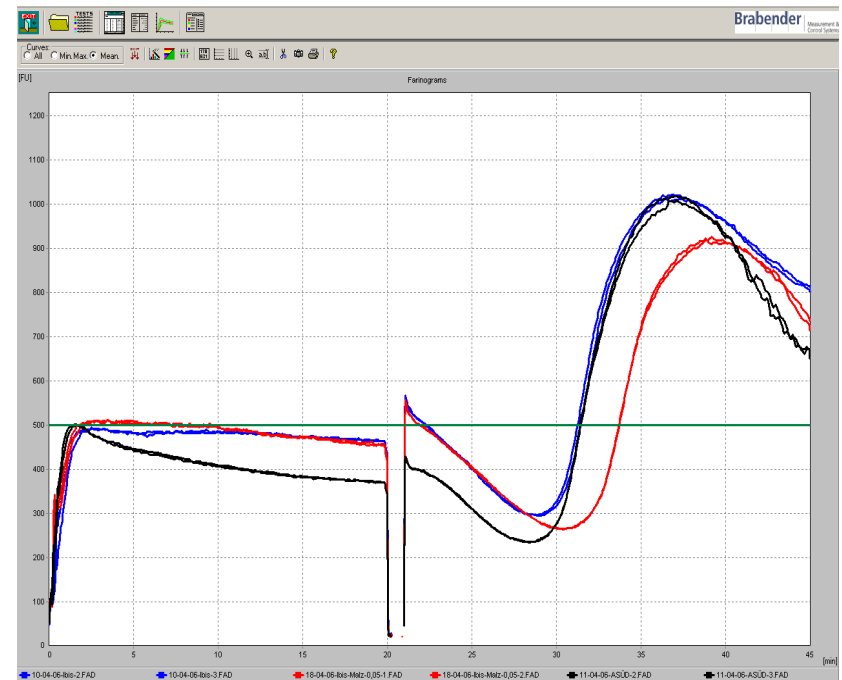
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Brabender® Farinograph®-AT – special applications

Programming and automatic evaluation of complex test profiles

Since 40 years used in research and development with the Brabender® Plastograph® / Farinograph®

First published in 1969:
(Determination of Gelatinization Properties of Highly concentrated Starch Suspensions by Brabender Plastograph, Goto J., Nagoya Y.Y., Die Stärke, 5/21 Januar 1969)



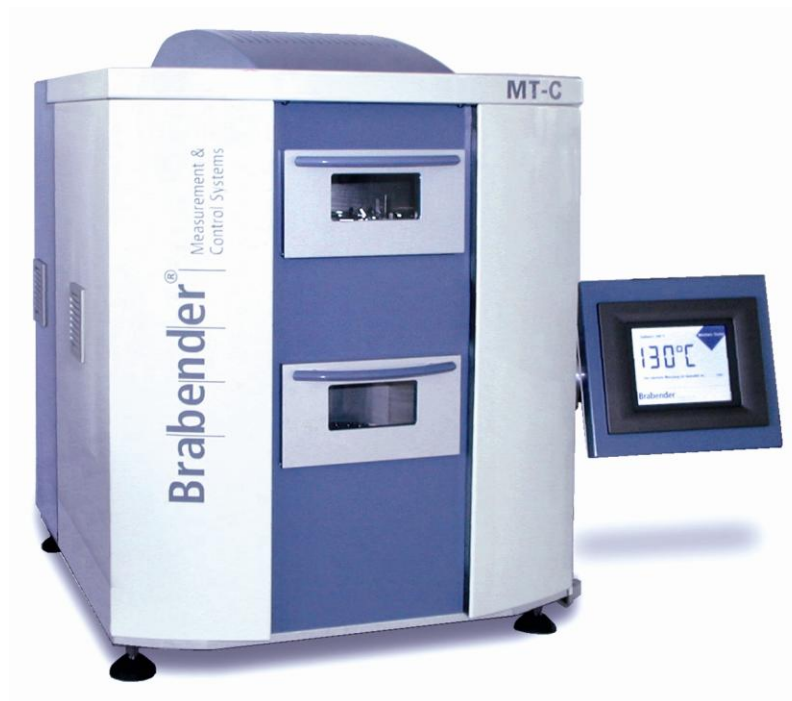
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Recent Developments in Rheological Instruments

Brabender® Rapid Moisture Tester MT-C

Brabender® Rapid Moisture Tester MT-C



...where quality is measured.

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Features

- Rapid oven drying method
- 10 samples at the same time
- Sample weight 9-11 g
- Automatic reweighing after the test time
- Automatic calibration of the integrated balance
- Accuracy better 0.1 %

No incorrect operation possible = 100% correct results

Why rapid analyzer MT-C?

MT-C (155 °C / 20 min)

- One test = 20 min.
- Two tests = 22 min.
- Ten tests = approx. 40 min.
- 20 tests = approx. 85 min.

Drying balance (10 min)

- One test = 10 min.
- Two tests = 22 min.
- Ten tests = approx. 120 min.
- 20 tests = approx. 240 min.

Parameter flour

- Standard: 130 °C / 60 min
- Rapid: 155 °C / 20 min

Advantages compared to other instruments (NIR, drying balances) :

- Fundamental method (Drying oven method)
- No calibration necessary
- Careful drying, no overheating of the material
- Accuracy better 0.1 %
- Up to 10 samples at a time
- **High automation rate makes user mistakes impossible**

Micro Visco-Amylo-Graph® (MVAG)



...where quality is measured.

Measures and checks

- Gelatinization properties of flour and starch
- Enzyme activity of flour (to find sprout damage)
- Adjustment of the diastatic activity of flour by adding enzymes (e.g. malt)
- Pasting properties of native and modified starch
- Extruded products and the influence of extrusion conditions

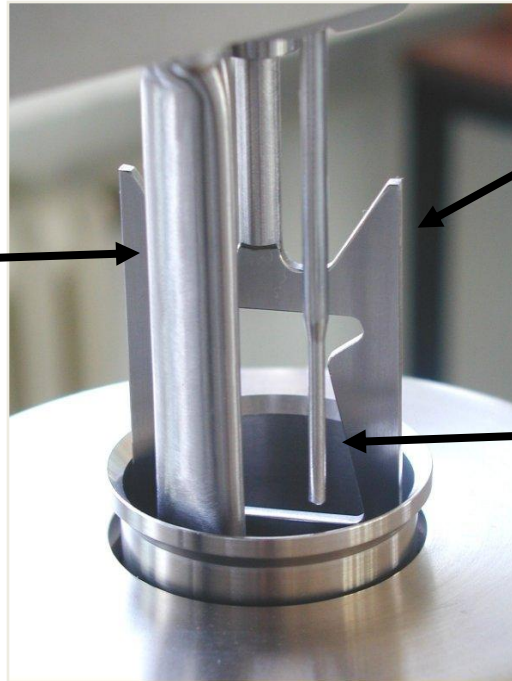
Advantages

- Small sample size
 - ⇒ Not too small (weighing mistakes have slight influence)
- High heating and cooling rates
 - ⇒ Up to real 10°C/minute
 - ⇒ Short test time
- Measuring of the temperature in the sample
 - ⇒ Real temperature
- Evaluation in BU, cmg, or mPas

Brabender® Micro Visco-Amylo-Graph® Measuring system

Measuring system

Cooling Probe:
Sample directly cooled
in the cup



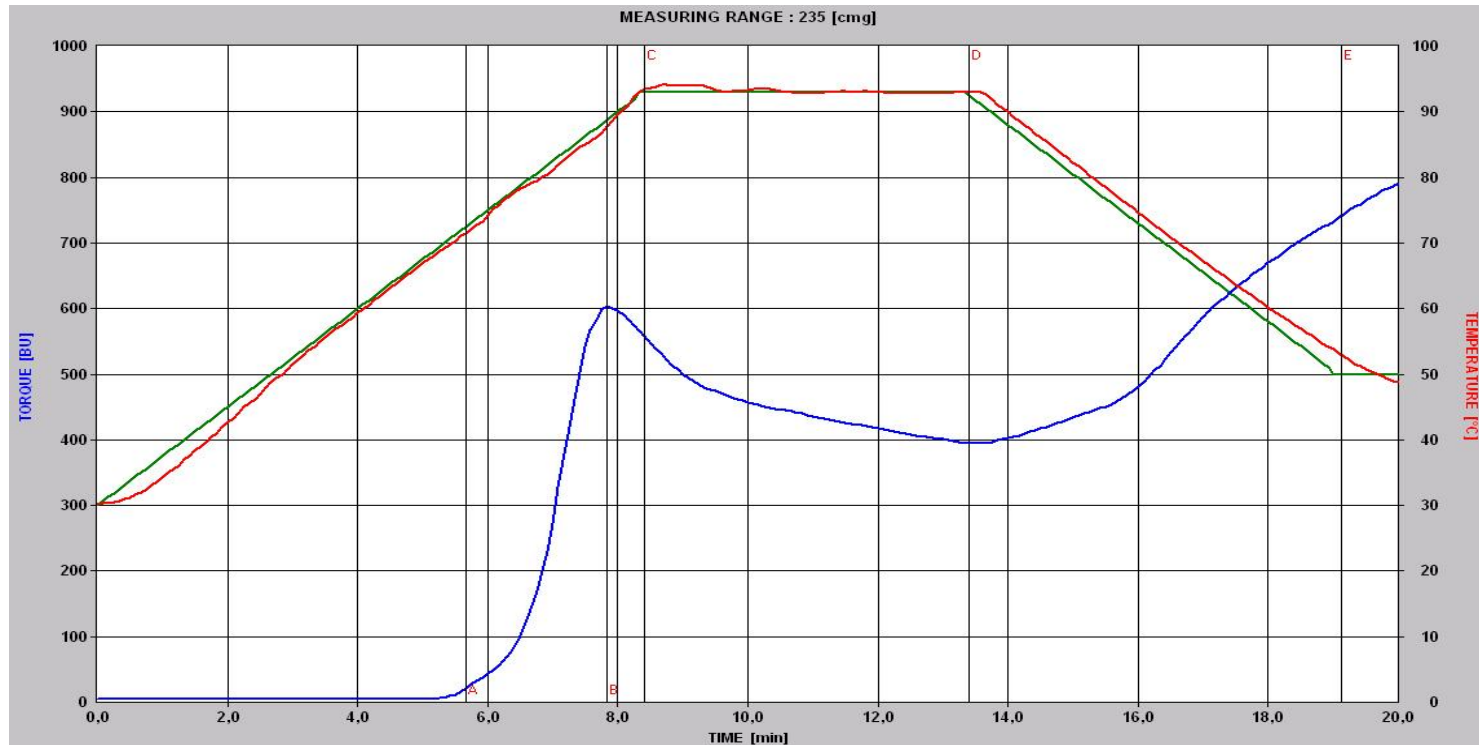
Stirrer/paddle

Temperature
Sensor:
In the sample

...where quality is measured.

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Measuring of temperature



Red line: reference

Green line: actual

...where quality is measured.

Recent Developments in Rheological Instruments

Summary

The new generation of Brabender® equipments

- ⇒ meet international standards (AACC, ICC, ISO)
 - ⇒ provide more opportunities for special application
 - ⇒ set new standards in accuracy
 - ⇒ show a lot of automation
 - ⇒ make the work easier
- with the best benefit for our customers**

Meet us at booth B16 to get

- **more information**
- **the presentation**
- **special solutions for your needs**

T h a n k y o u v e r y m u c h f o r y o u r a t t e n t i o n