



Crucial factors in quality control

Brabender® GmbH & Co. KG

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Crucial factors in quality control

Agenda

- Introduction
 - Quality control along the grain chain
 - Standard quality testing methods,
 - Scientific societies in the milling and baking sector
- Quality control in grain trade and storage, flour mill and bakery
 - Measuring criteria
 - Applicable methods and comparison of those
- Trends in quality control
- Conclusion

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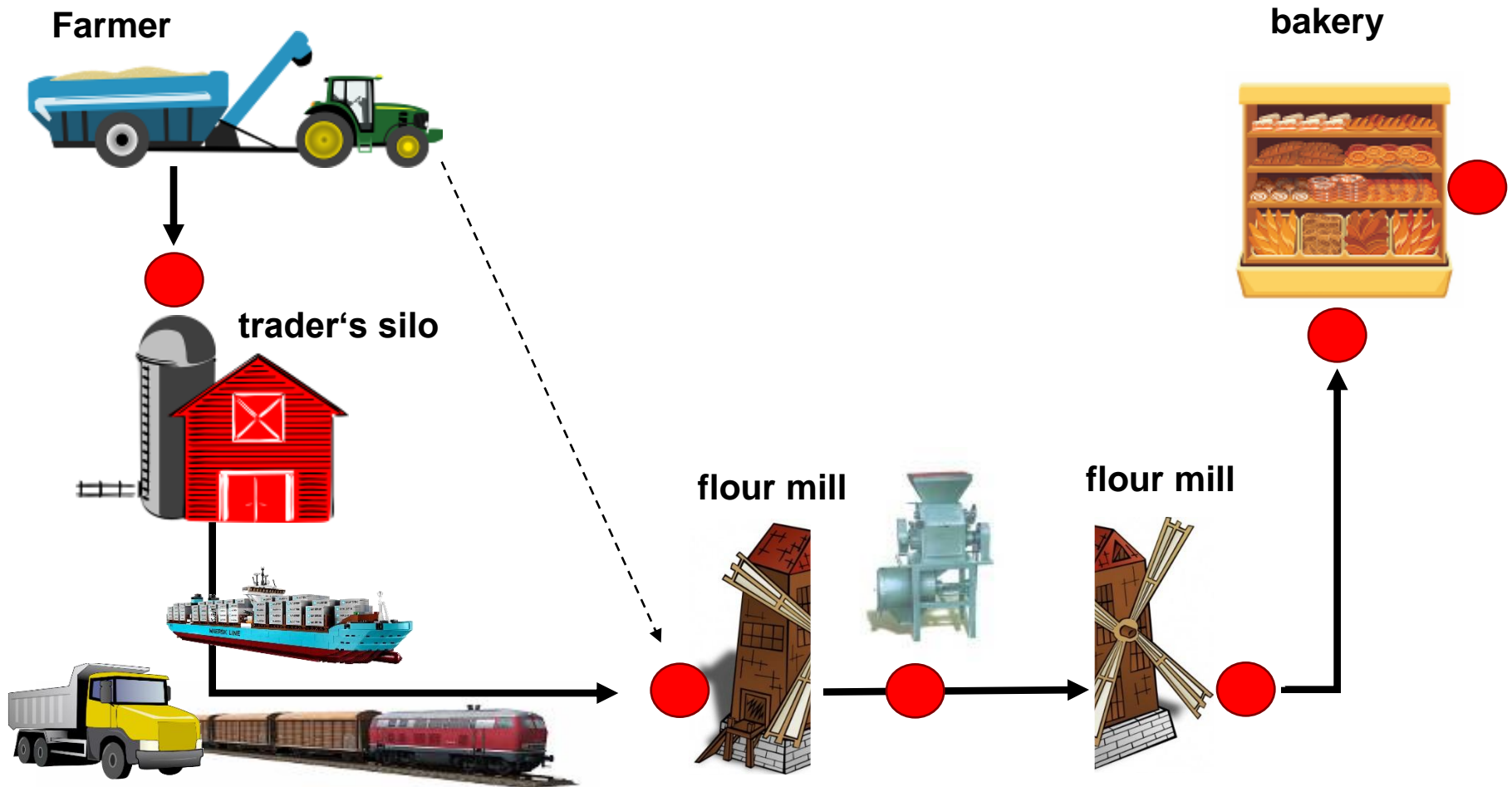
Crucial factors quality control

Introduction

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Introduction

In which steps of the grain value chain is quality control involved?



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Introduction

General benefits of quality control for grain traders, millers and bakers



- ✓ Simplification of communication between buyers and sellers by specifying a certain grain and flour quality
- ✓ Check the supplied grain / flour in accordance with given specifications at the receiving station
- ✓ Determination how flour performance and best suitable application
- ✓ Providing a stable production and product quality
- ✓ Avoidance of production waste and loss
- ✓ Reduction of production costs: Cost optimization



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Introduction

Standard quality testing methods in the milling and baking sector

Definition of standard methods

The determination and application of standard methods serve as a basis for comparing the obtained measuring results, within the scope of their worldwide or regional validity and their approval by public authorities, institution and the market.

Important: Standard methods do not give any information about whether a quality of a flour can be considered as good or bad! This depends on the exact application.



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Introduction

Standard quality testing methods in the milling and baking sector

Standard methods

- Procedure for the sample preparation
- Method and handling for realization
- Field of application
- Laboratory instruments to be used
- Evaluation and displaying of the results
- Reproducibility of the results



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Introduction

Scientific societies in the milling and baking sector

AACC (American Association of Cereal Chemists)



ICC (International Association for Cereal Science and Technology)



ISO (International Organization for Standardization)



International
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Standardization



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Quality control in grain trade and storage

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Quality control in grain trade and storage

What can grain traders achieve and avoid with quality control?

Importance of quality control for grain traders

- Define specifications and simplify communication with suppliers
- Right selection of grains according to the customers' specifications
- Minimize wrong deliveries from suppliers or to customers
- Avoid complaints and returns from customers
- Avoid inadequate storage conditions



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Quality control in grain trade and storage

Measuring criteria: Moisture content

Why is this important for grain trade and storage?

- Moisture is an indicator of grain storability
- High moisture content (over 14.5%) attracts mold, bacteria, and insects
Consequence: grain quality is negatively effected during storage
- Wheat or flour with low moisture content is more stable during storage

Examples for applicable methods:

- Drying oven method
- Near infrared spectroscopy (NIR)
- Drying balance






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Quality control in grain trade and storage

Measuring criteria: Moisture content

Method	+	-	Instrument
Drying oven method	Reference method, No calibrations	Time	
NIR method	Easy handling, Quick execution	Calibration required, No reference method	
Drying balance method	No calibrations, Low cost	Small sample size	



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Quality control in grain trade and storage

Measuring criteria: Moisture content

Automised drying oven method

- „Start the tests, the MT-CA does the rest!“
- 10 independent samples at a time
- Automatic drying and evaluation process
- World wide accepted reference method

No. of tests	MT-CA	Drying balance
1	60 min	10 min
2	62 min	22 min
5	~ 70 min	~ 60 min
10	~ 80 min	~ 120 min
20	~ 160 min	~ 240 min



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Quality control in grain trade and storage

Measuring criteria: Rheological properties

Why is this important?

- More than absolute data (protein content)
- Quick grain classification
- Clear information on grain quality

Examples of applicable methods:

- Gluten Peak Test
- Gluten Washer with Gluten Index



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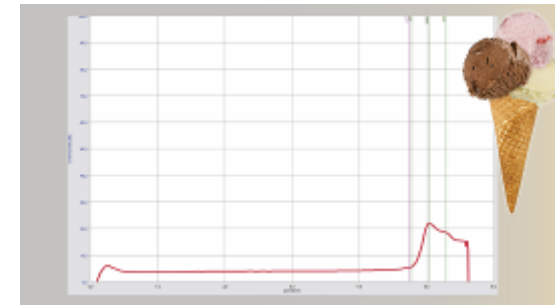
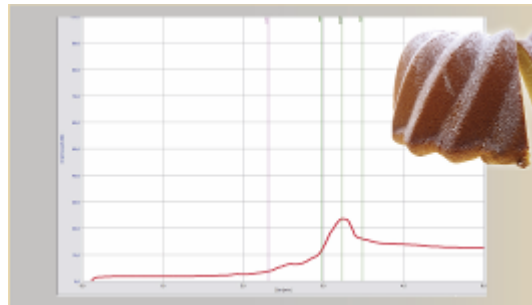
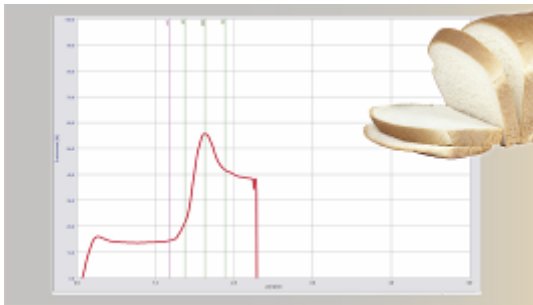
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Quality control in grain trade and storage

Measuring criteria: Rheological properties

Gluten Peak Test

- High energy input in a suspension of water and a ground cereal product
- Gluten aggregation according to its property
 - Strong gluten: short peak time with a high peak
 - Weak gluten: long peak time with a low peak



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Quality control in grain trade and storage

Measuring criteria: Rheological properties

	+	-
Gluten Peak Test	<p>Rapid and easy</p> <p>Small sample size</p> <p>Analysis of the complete flour sample</p> <p>High informative value of the whole curve</p>	<p>New method, thus little data</p>
Gluten Washing Method	<p>Well-known method</p> <p>Small sample size</p> <p>Easy with flour</p>	<p>Time consuming</p> <p>Difficult with whole grain flour</p>

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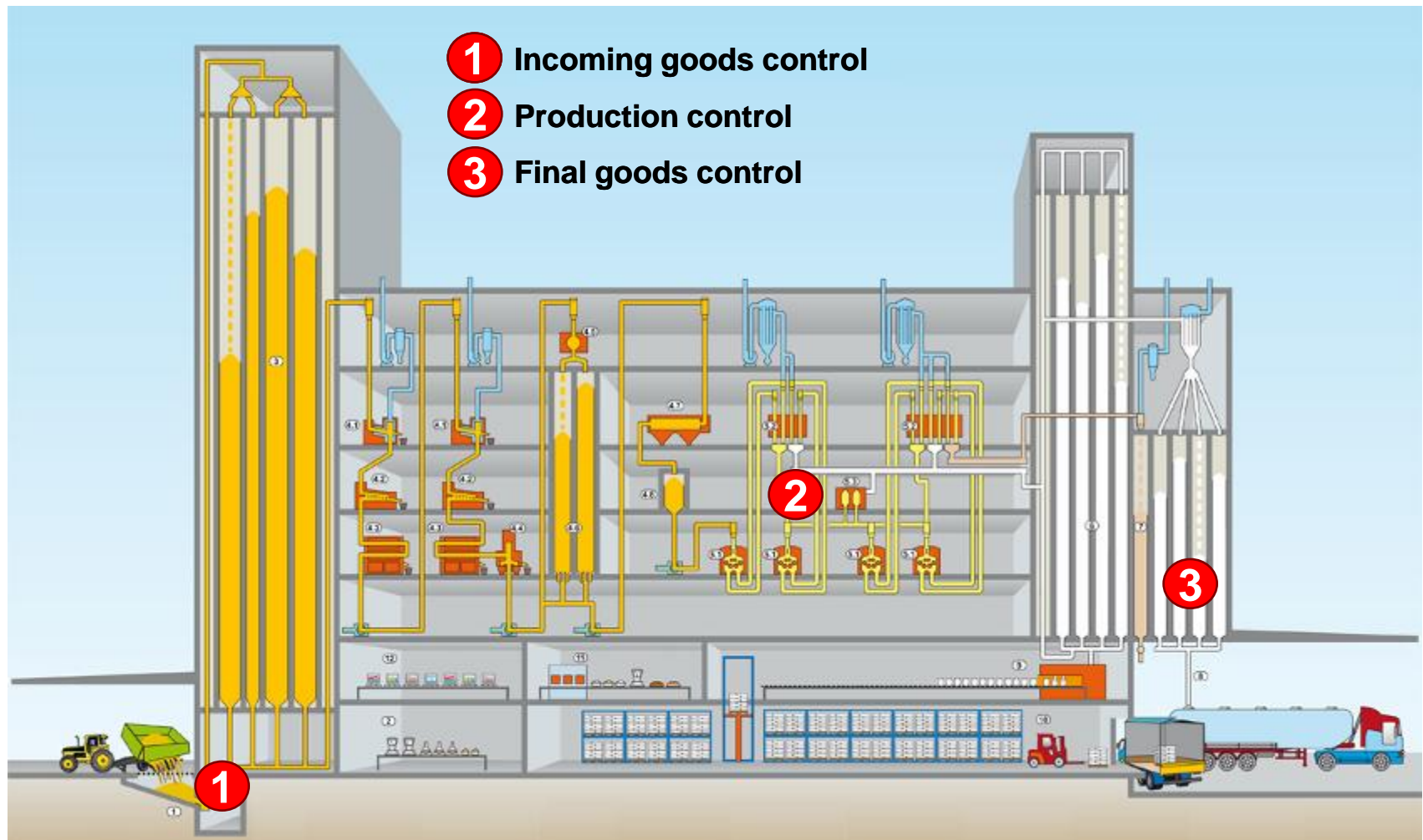


Quality control in the flour mill

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Quality control in the flour mill

Where is quality control involved?



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Quality control in the flour mill

Where is quality control involved?

Incoming goods control

- Quick quality evaluation, e. g. for silo filling
- Price determination and negotiation

Production control

- Analysis of flour quality and properties to carry out corrections if necessary

Final goods control

- Assurance and documentation of the flour quality
- Final quality test



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Quality control in the flour mill

What can millers achieve and avoid with quality control?

Importance of quality control for millers

- Define specifications and avoid wrong deliveries, avoid delays in production
- Test incoming goods for defined specifications
- Avoid inadequate storage conditions
- Prove specifications from customers, avoid complaints and returns
- Control the production process and minimize production waste



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Quality control in the flour mill

Which measuring criteria are crucial?

Analysis of incoming grains and outgoing flours

- Moisture content
- Flour water absorption
- Dough resistance / extensibility
- Flour starch viscosity
- Gluten quality



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Quality control in the flour mill

Measuring criteria: Flour water absorption

Why is this important for millers?

- Estimation of the optimum water amount for a flour to form a dough
 - weak gluten flour: low water absorption and short stability time
 - strong gluten flour: high water absorption and long stability time
- Prediction how a flour will react in different stages of production and baking
- Definition of flour specifications for a given purpose
- Assurance of stable product quality

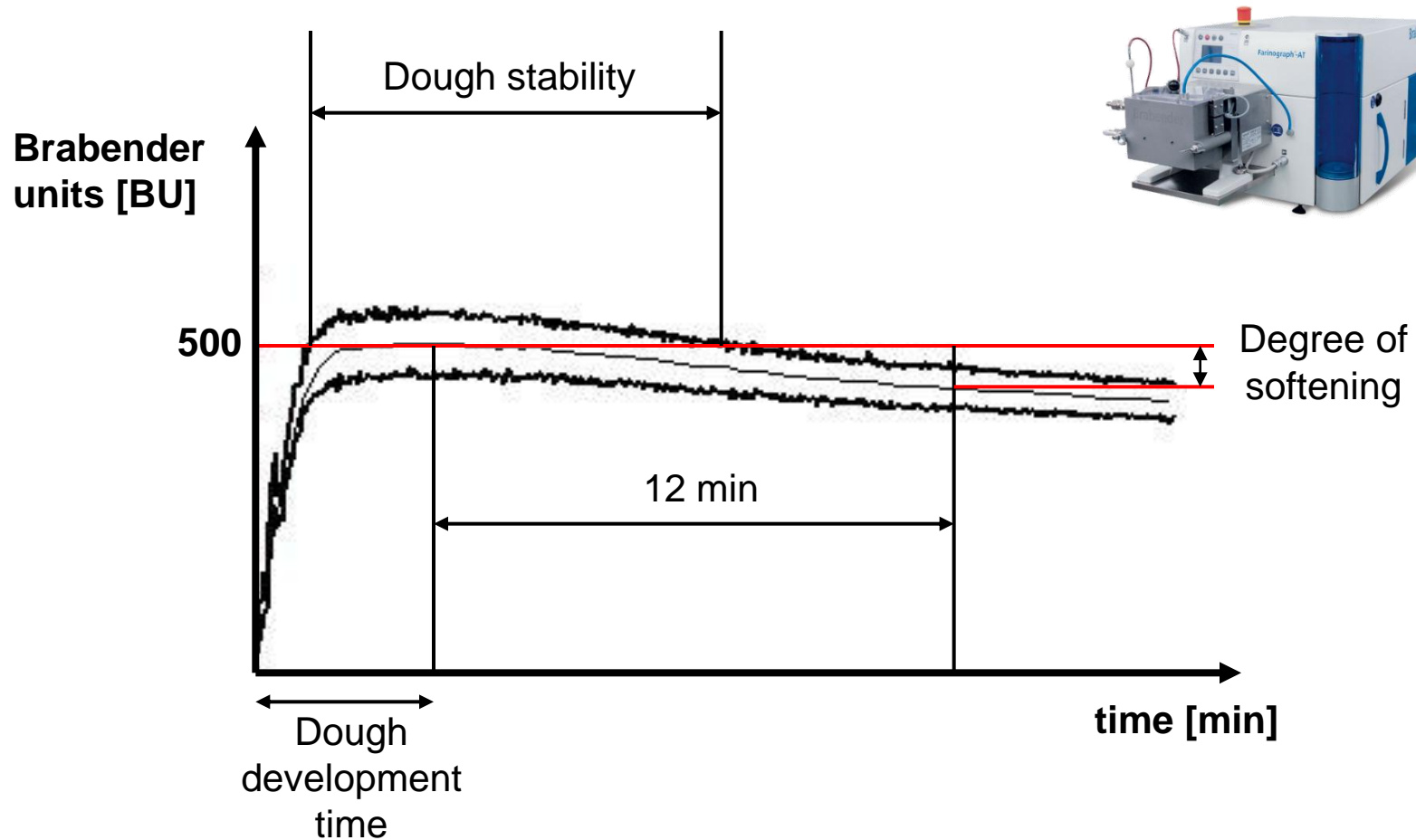


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Quality control in the flour mill

Measuring criteria: Flour water absorption



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Quality control in the flour mill

Measuring criteria: Dough resistance / extensibility

Why is this important for millers?

- Verification of suitability of the flour for a certain task
- Determination of gluten strength and bread-making characteristics of flour

Examples of applicable methods:

- Extensograph[®]
- Alveograph[®]



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Quality control in the flour mill

Measuring criteria: Dough resistance / extensibility

	Extensograph®	Alveograph®
Principle	A dough string is stretched with a hook	Air is blown into a dough patty
Area under Curve	Energy	W-Value
Peak height	Resistance	P-Value
Curve length	Extensibility	L-Value
+	Different test times	Short test procedure

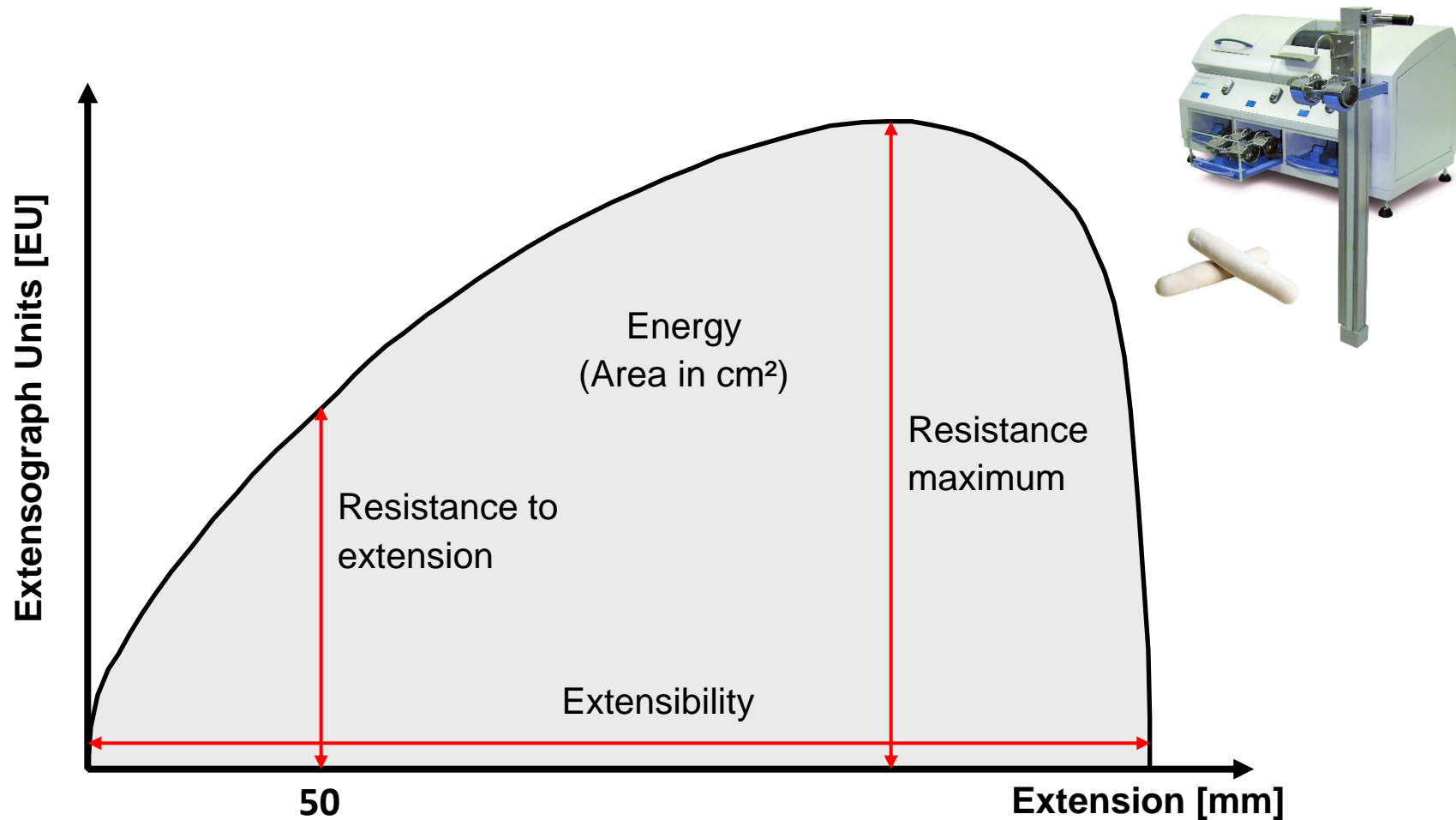


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Quality control in the flour mill

Measuring criteria: Dough resistance / extensibility



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Quality control in the flour mill

Measuring criteria: Flour starch viscosity

Why is this important for millers?

- Prediction of the baking properties of flour
- Assessment of the suitability of the flour for various applications
- Assessment of the amount of sprout damage
 - Produces sticky dough that results in problems during processing
 - Results in products with poor color and weak texture

Example of applicable methods:

- Amylograph®
- Falling Number





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Quality control in the flour mill

Measuring criteria: Flour starch viscosity

	+	-
<p>Amylograph®</p> 	<p>Production orientated conditions</p> <p>Curve gives additional information</p> <p>Registration of the whole enzyme spectrum due to gentle heating</p>	<p>Long duration, though high time effort</p>
<p>Falling Number</p>  <p>© Perten Instruments</p>	<p>Quick method</p> <p>Easy handling</p>	<p>Boiling water partly deactivates enzymes</p>

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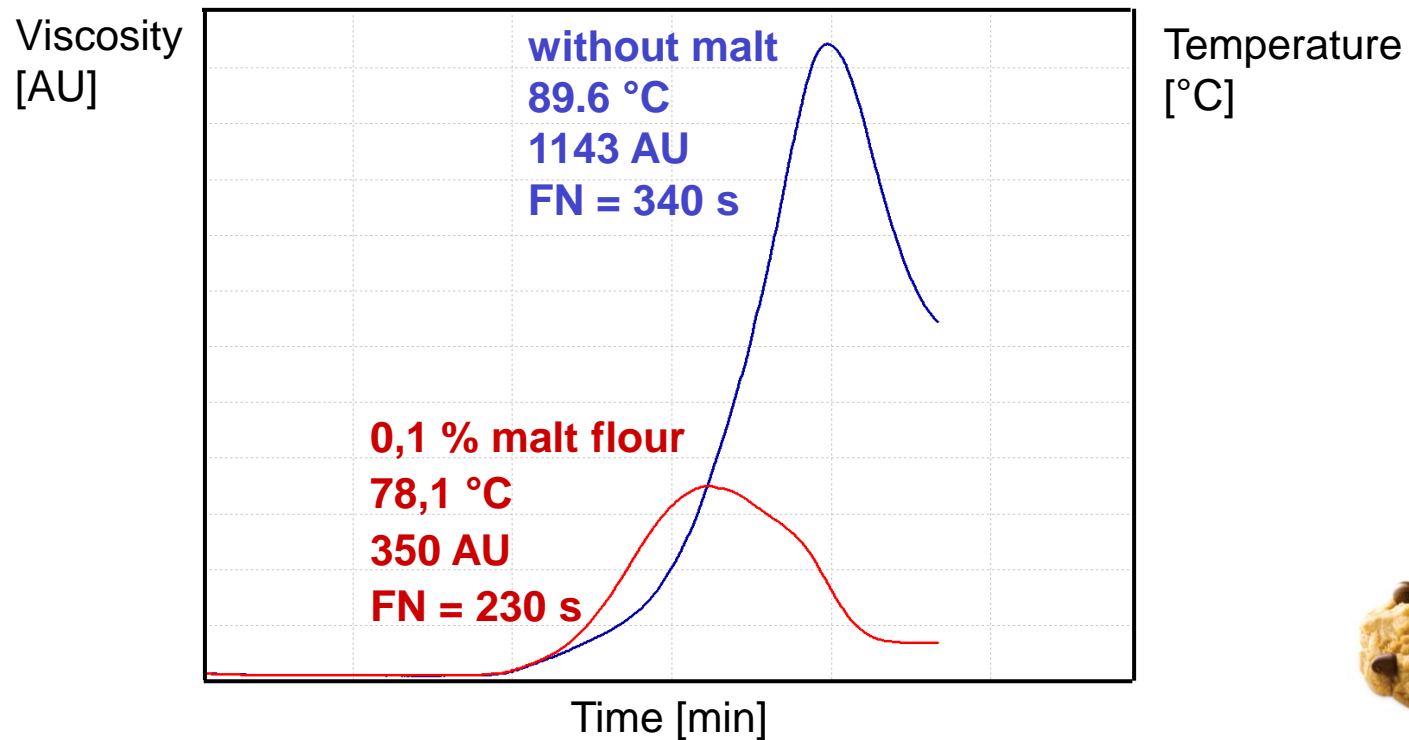
Quality control in the flour mill

Measuring criteria: Flour starch viscosity

Difference in flour starch viscosity

Difference

- Amylo® = 793 AU (70 %)
- FN = 110s (33 %)



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Quality control in the flour mill

Measuring criteria: Gluten quality

Why is this important?

- Gluten is responsible for the elasticity and extensibility characteristics of dough
- Stretching and elastic properties of gluten give information about flour quality and the suitability for a given purpose
- Recognition of drying and heat damage on flour and dry gluten

Examples for applicable methods:

- Gluten Peak Test
- Gluten Washing method with Gluten Index



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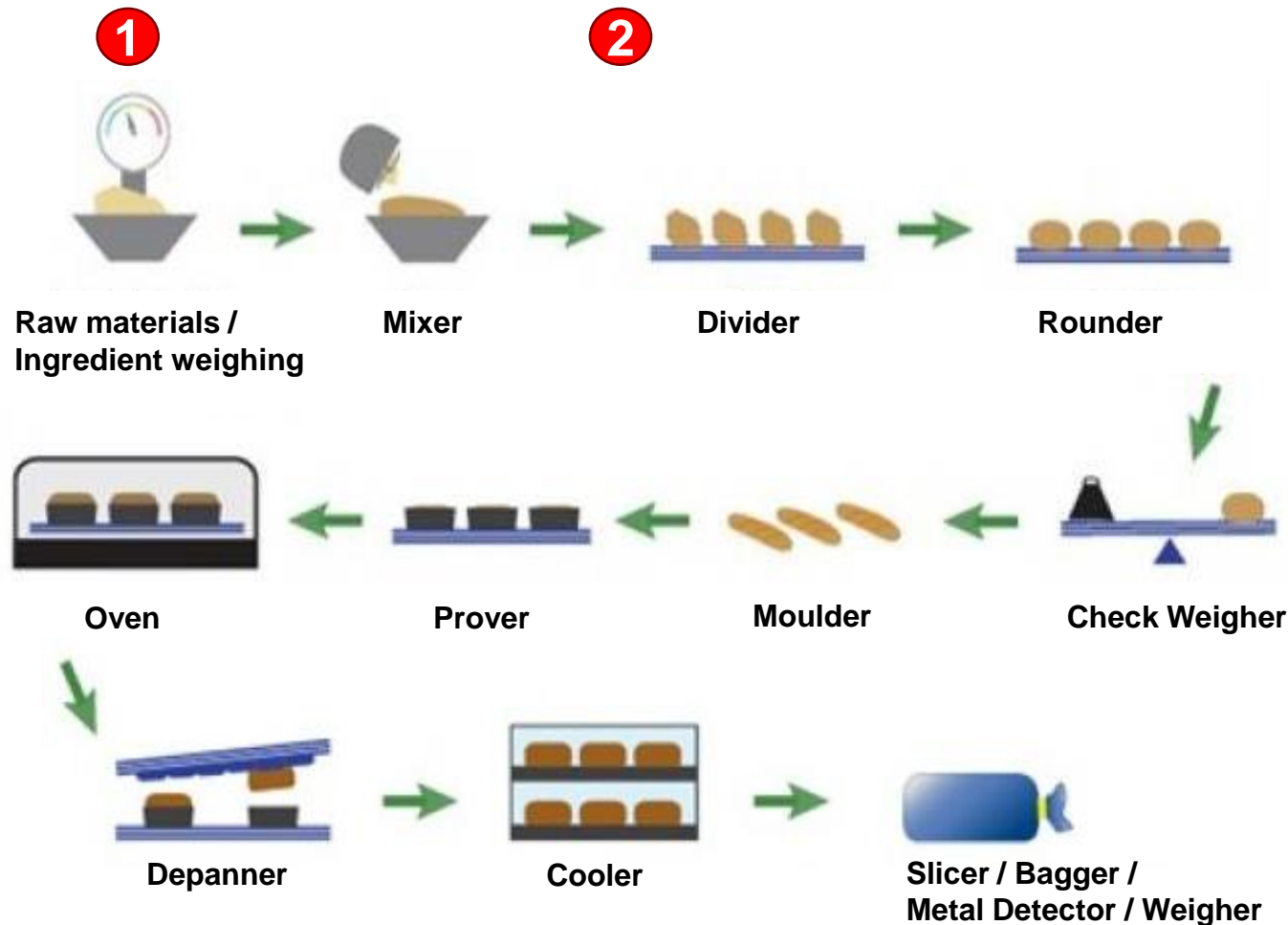


Quality control in the bakery

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Quality control in the bakery

Where is quality control involved?



1. Incoming goods control
2: Production control

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Quality control in the bakery

What can bakers achieve and avoid with quality control?

- Quality control for the incoming flour
 - Finding optimal flour and baking characteristics
 - Find the right application for different flours
 - Avoid delays in production and inadequate storage
 - Control the production process and minimize production waste
 - Control additive effects
-
- Flour water absorption
 - Dough resistance / extensibility
 - Flour starch viscosity



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Quality control in the bakery

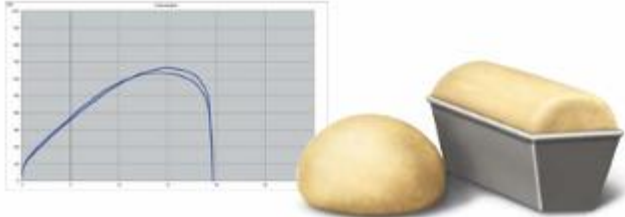
Measuring criteria: Flour water absorption

Optimization of water absorption			
	current	optimized	optimized
Water absorption	57 %	59 %	61 %
Dough per 1 kg of flour	1,57 kg	1,59 kg	1,61 kg
Dough per 1000 t of flour	1.570 to	1.590 to	1.610 to
Additional dough quantity		20 to	40 to
Increased turnover (add. dough * price)		???	???

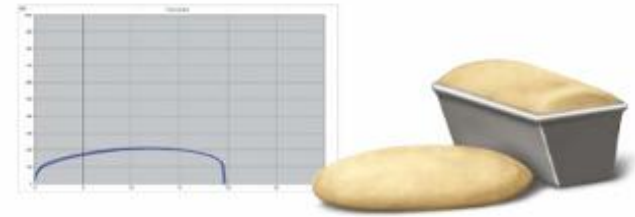
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Quality control in the bakery

Measuring criteria: Dough resistance / extensibility



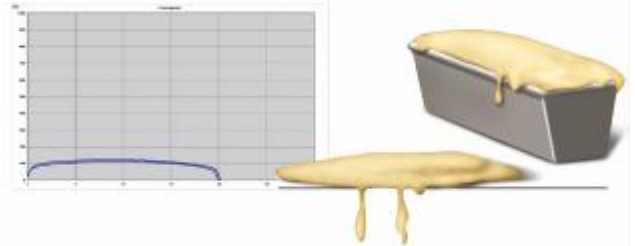
- Strong flour and extensible, elastic dough
- Light, voluminous baking products with a good volume



- Flour producing a wet, plastic dough
- Small baking volume



- Rigid, tough dough structure and poor extensibility
- Results in small pieces of dough with poor spring



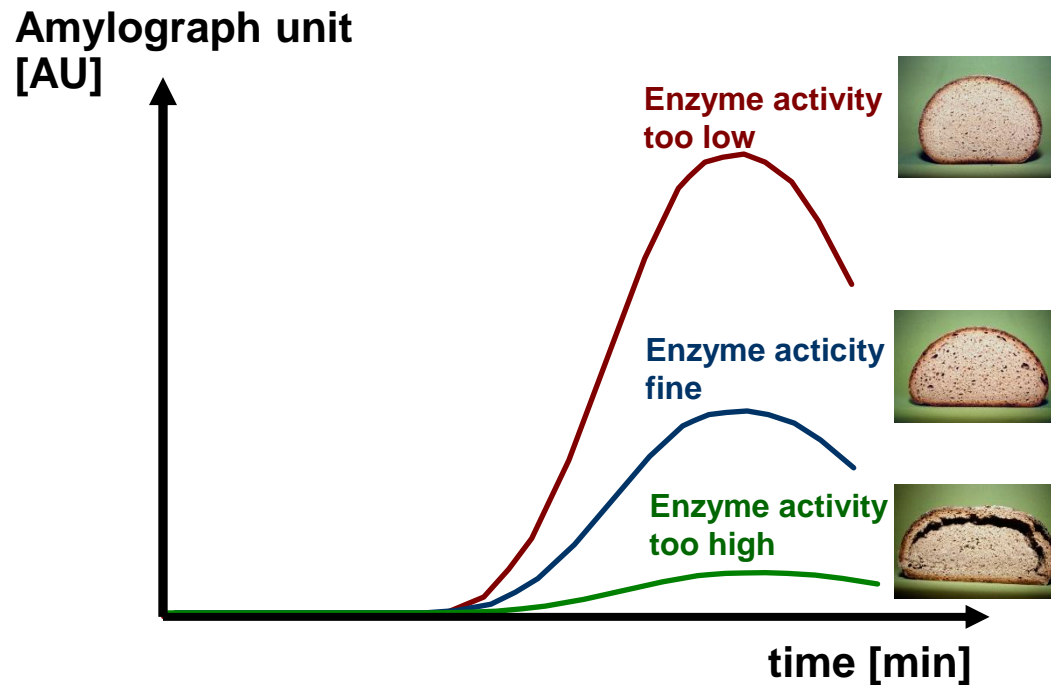
- Flour not suitable for normal baking products

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Quality control in the bakery

Measuring criteria: Flour starch viscosity



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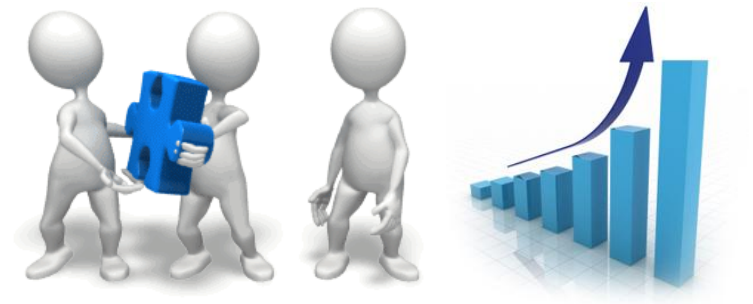
Trends in quality control

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Trends in quality control

Growing importance of quality control along the grain chain

- Simplify communication with all members of the grain chain by defining quality standards and specifications
- Avoid the vicious circle of production delays along the grain chain due to wrong deliveries
- Cost optimization along all members of the grain chain



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Trends in quality control

Growing importance of rapid methods

- Lacking manpower in laboratories of flour mills and bakeries
- Possibility of quick checks on defined specifications in the presence of the supplier
- Examples of rapid methods:
 - Gluten Peak Test (GlutoPeak®)
 - NIR (e. g. Inframatic, DA 7250)
 - Starch damage analysis (SDmatic)
 - Moisture analysis (MT-CA)



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Crucial factors in quality control

Conclusion

Quality control.

- Raw materials do not have good or bad technological properties
- The processor has to find the best suitable application
- Brabender® is your partner in finding the right application for the supplied grain and the produced flour



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