



Effect of Flour Storage Temperature on Tortillas



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R&D

Rheology Farinograph

Farinograph

- Mixing behaviour
- Water absorption
- Dough development time
- Stability
- Softening



Principle Farinograph



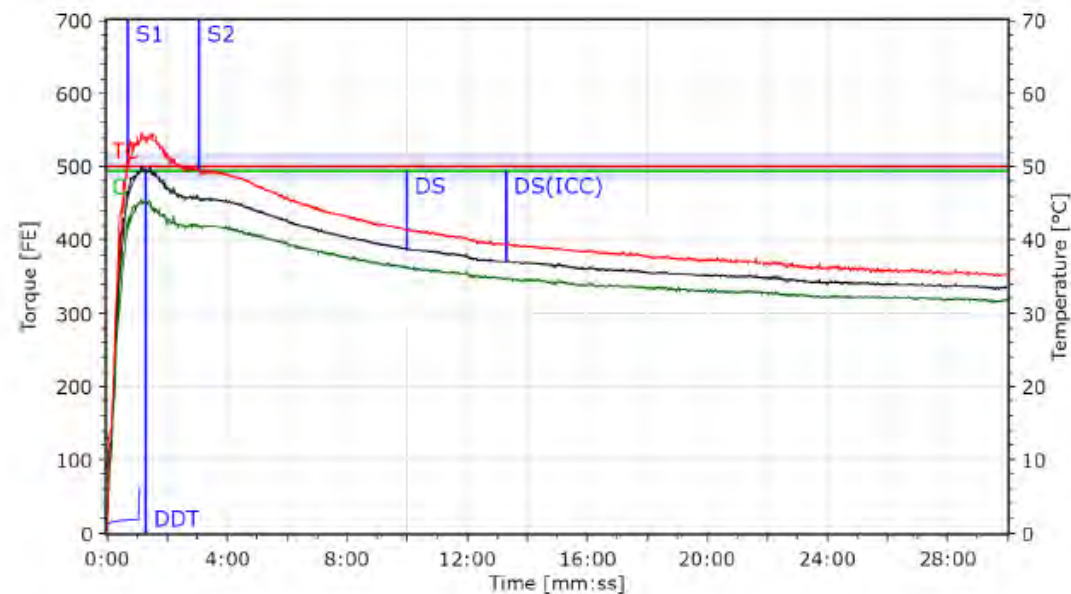
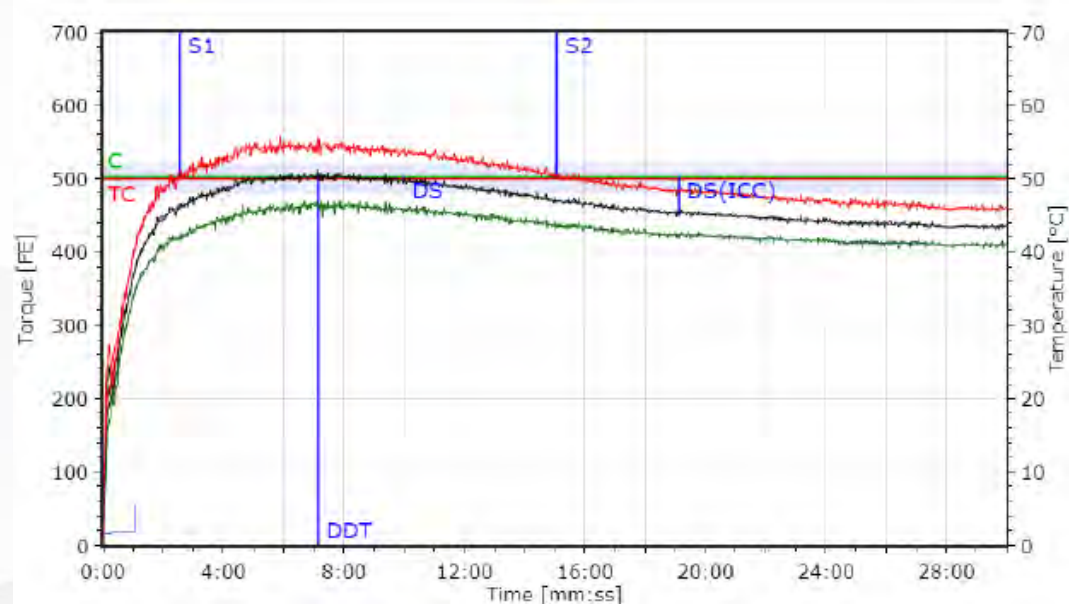
300 g



Optimum
consistency

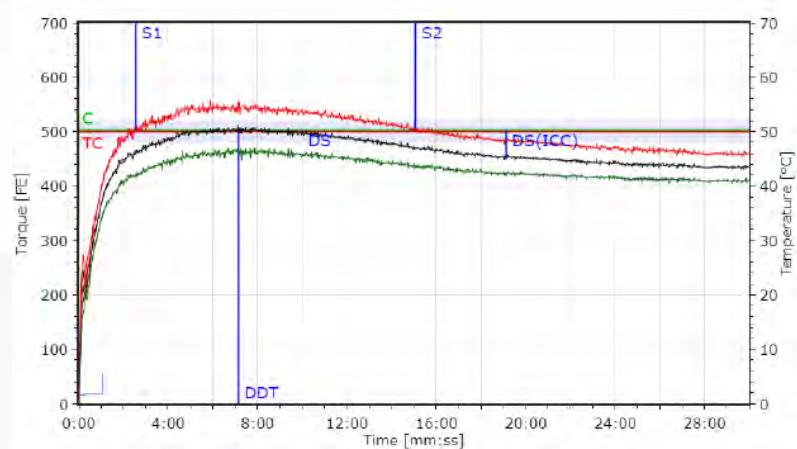
Interpreting the curve

Farinograph



Interpreting the curve

Farinograph



**Water
absorption (%)**

Low

<54

Normal

56

High

>60

**Dough
Development
Time (min)**

<1.5

1.5-5

>5

Stability (min)

<3

5-7

>10

Softening (BU)

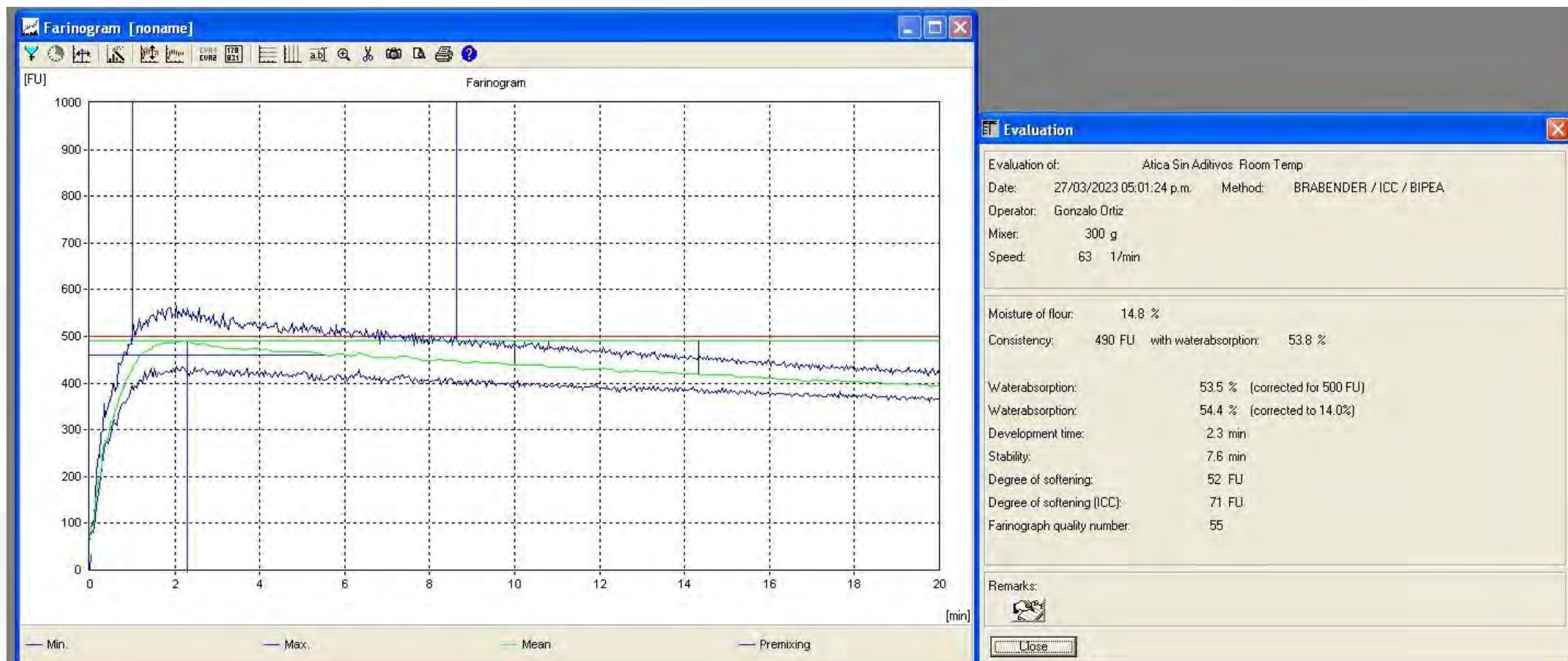
<30

30-70

>70

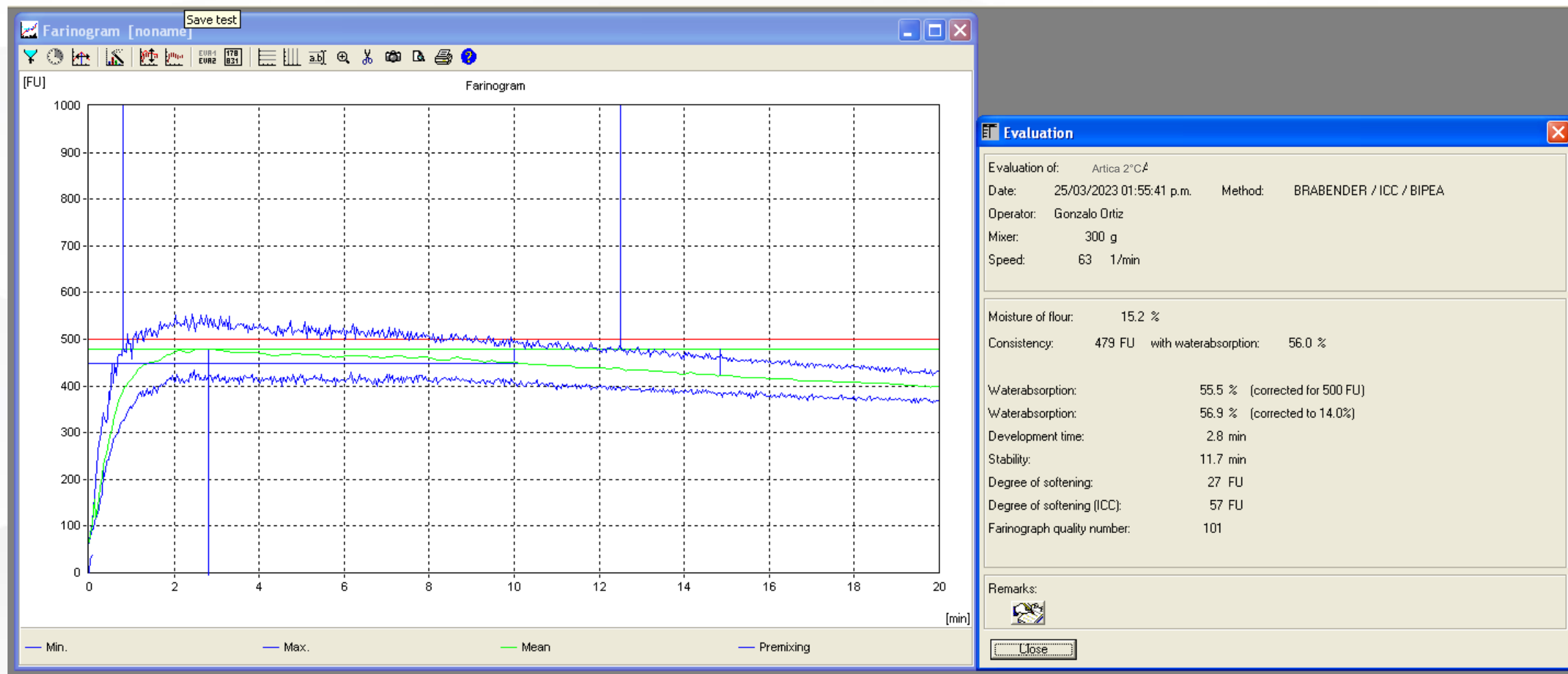
Farinograph

22°C



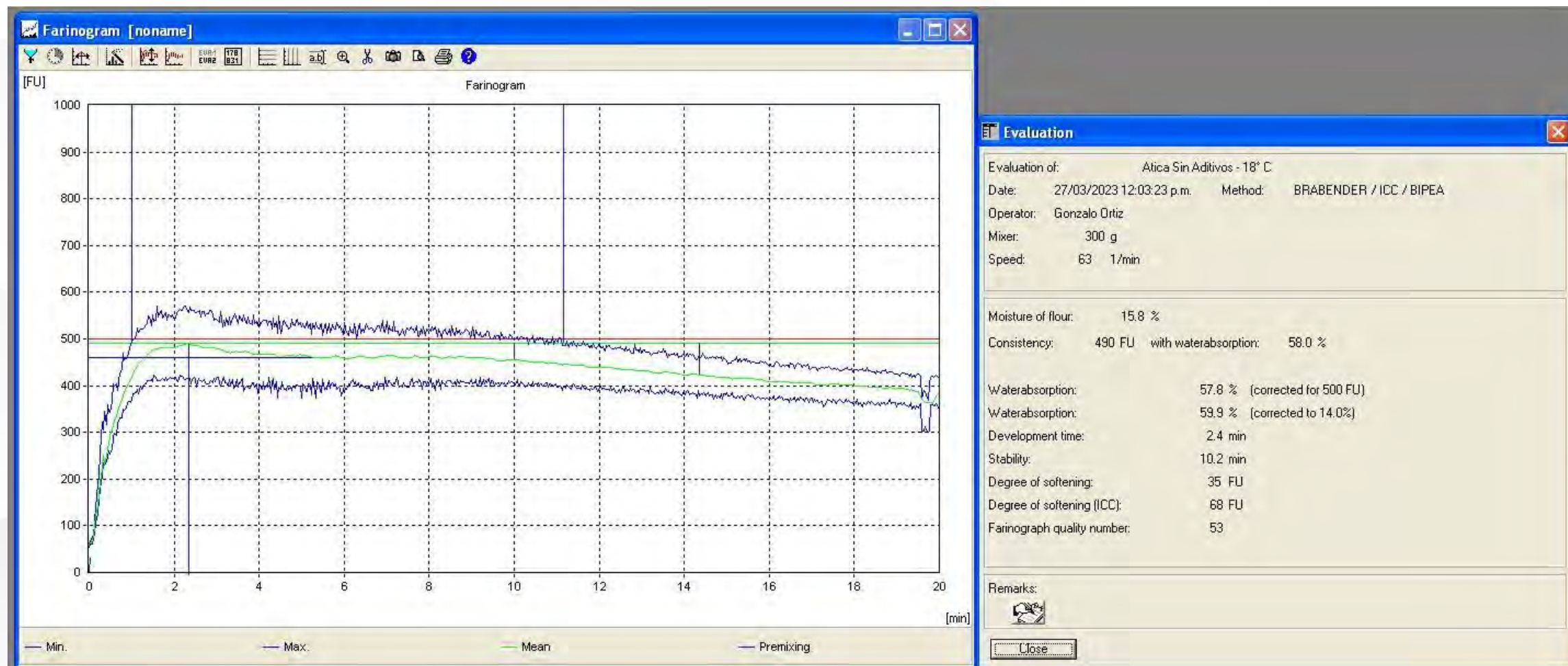
Farinograph

2°C storage



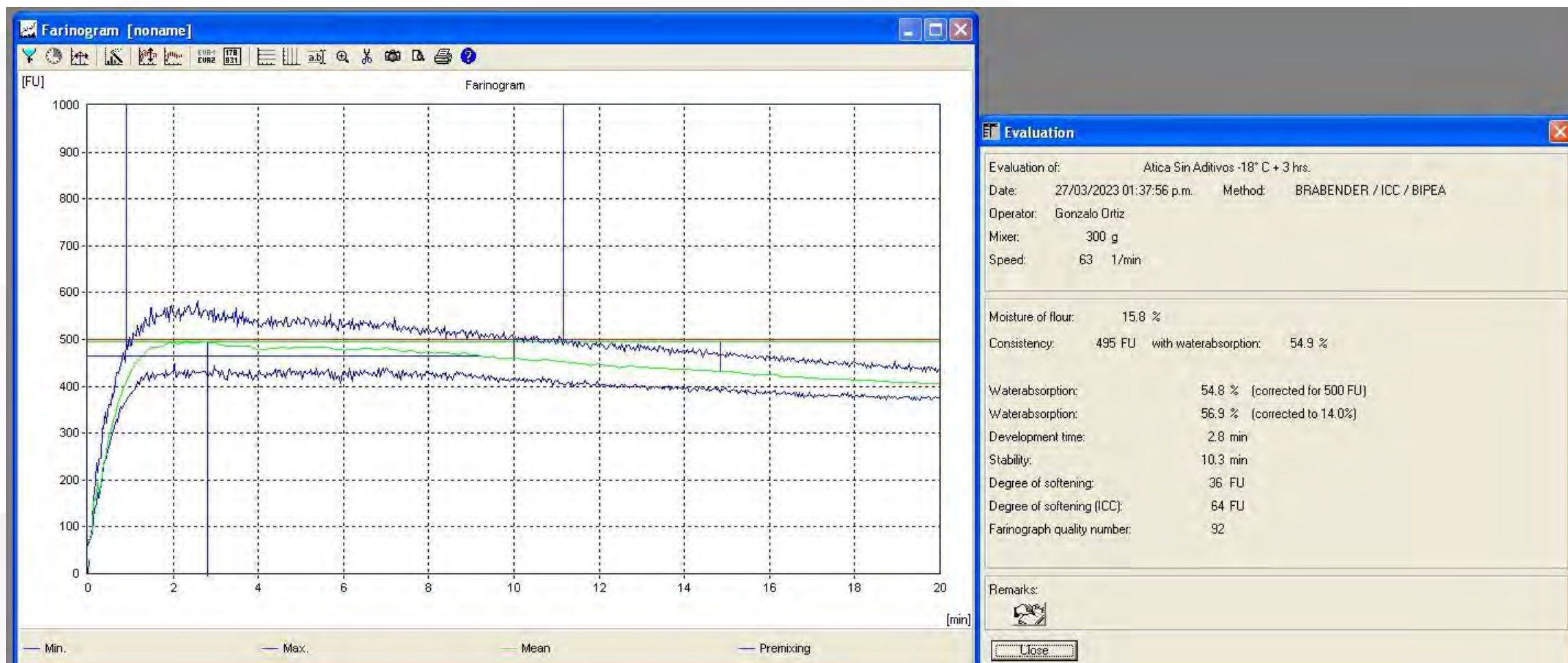
Farinograph

-18°C storage



Farinograph

-18°C + 3hrs room

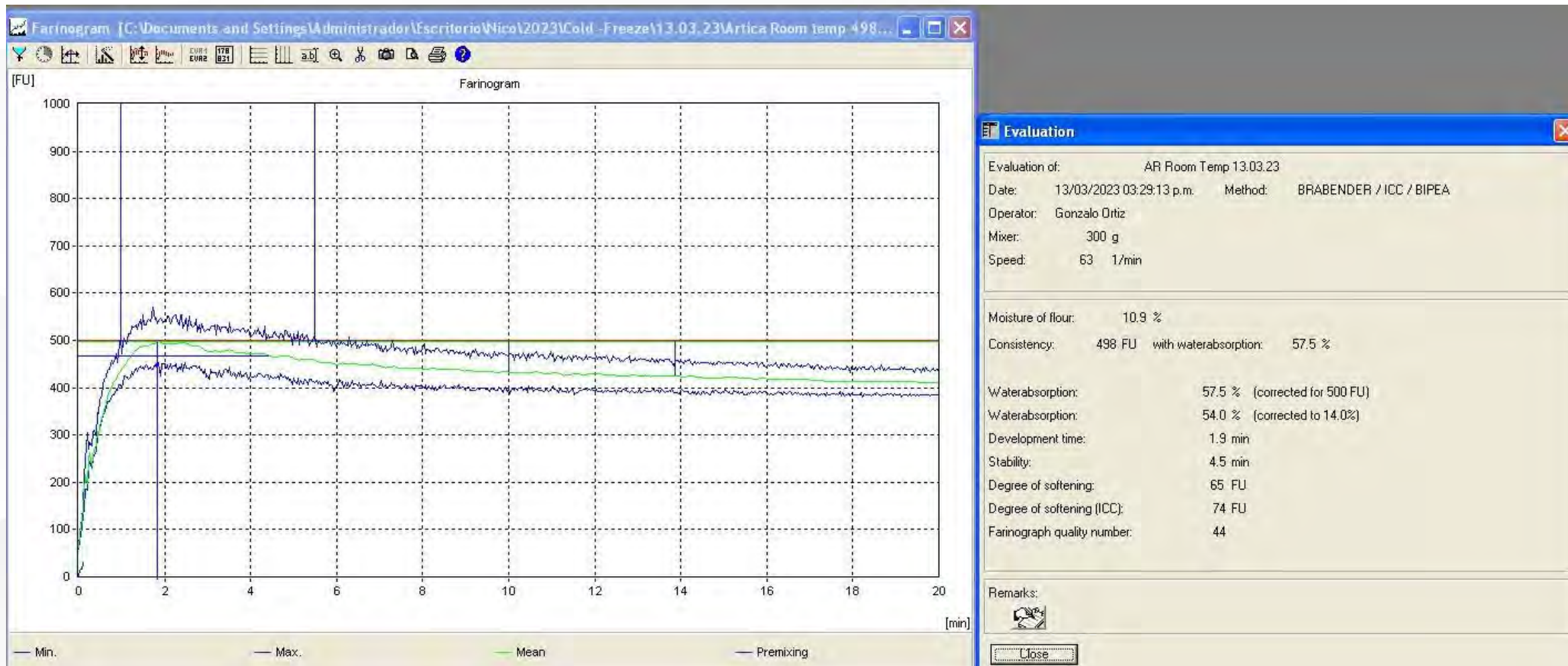


Results

	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	53.5 %	2.3 min	7.6 min
Flour 2°C	55.5 %	2.8 min	11.7 min
Flour -18 °C	57.8 %	2.4 min	10.2 min
Flour -18 + 3 hours room	54.8 %	2.8 min	10.3 min

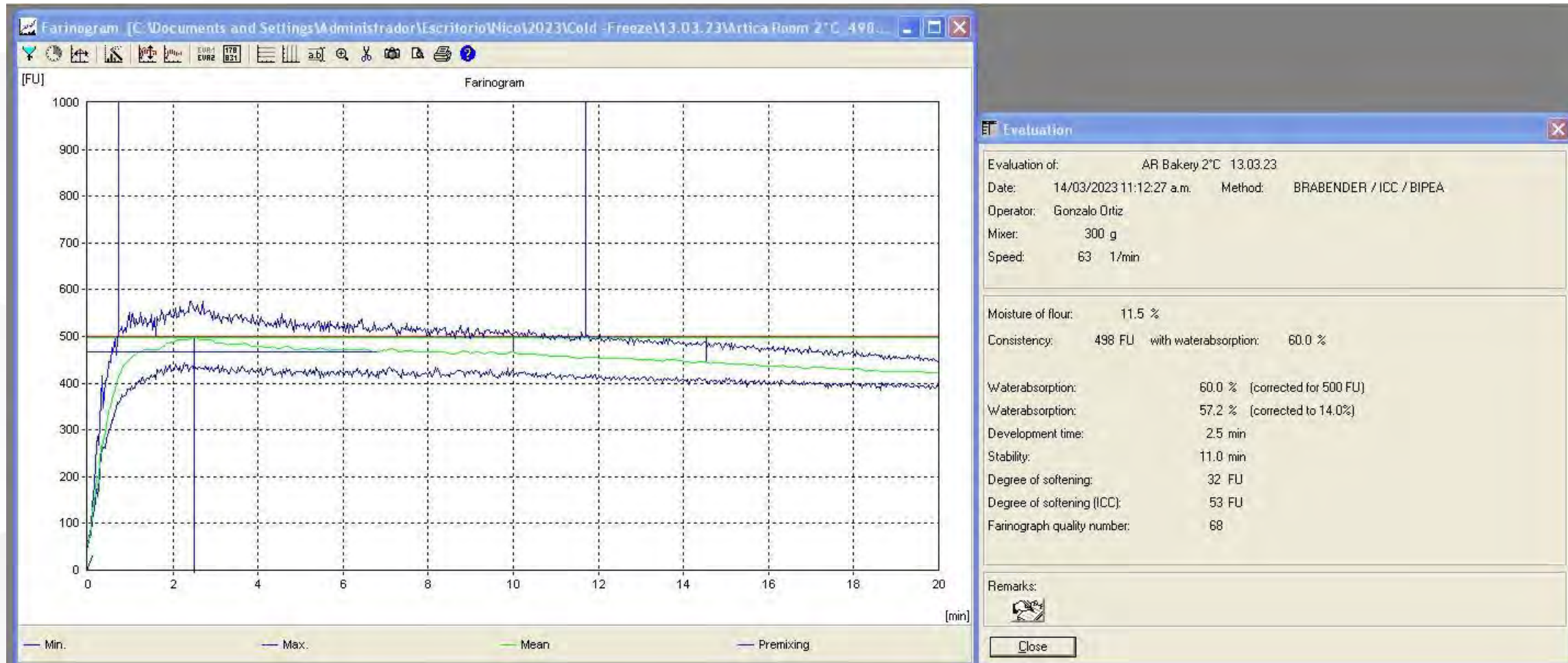
Farinograph

22°C



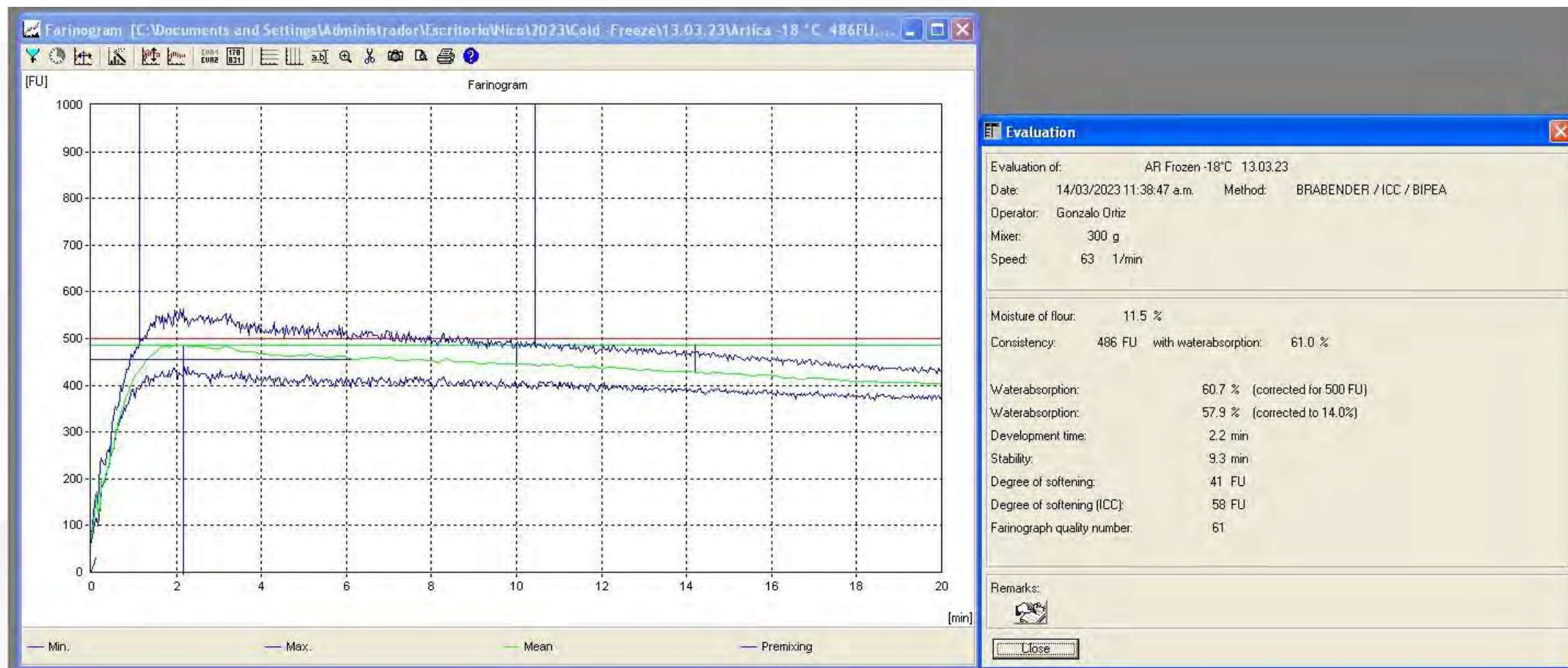
Farinograph

2°C storage



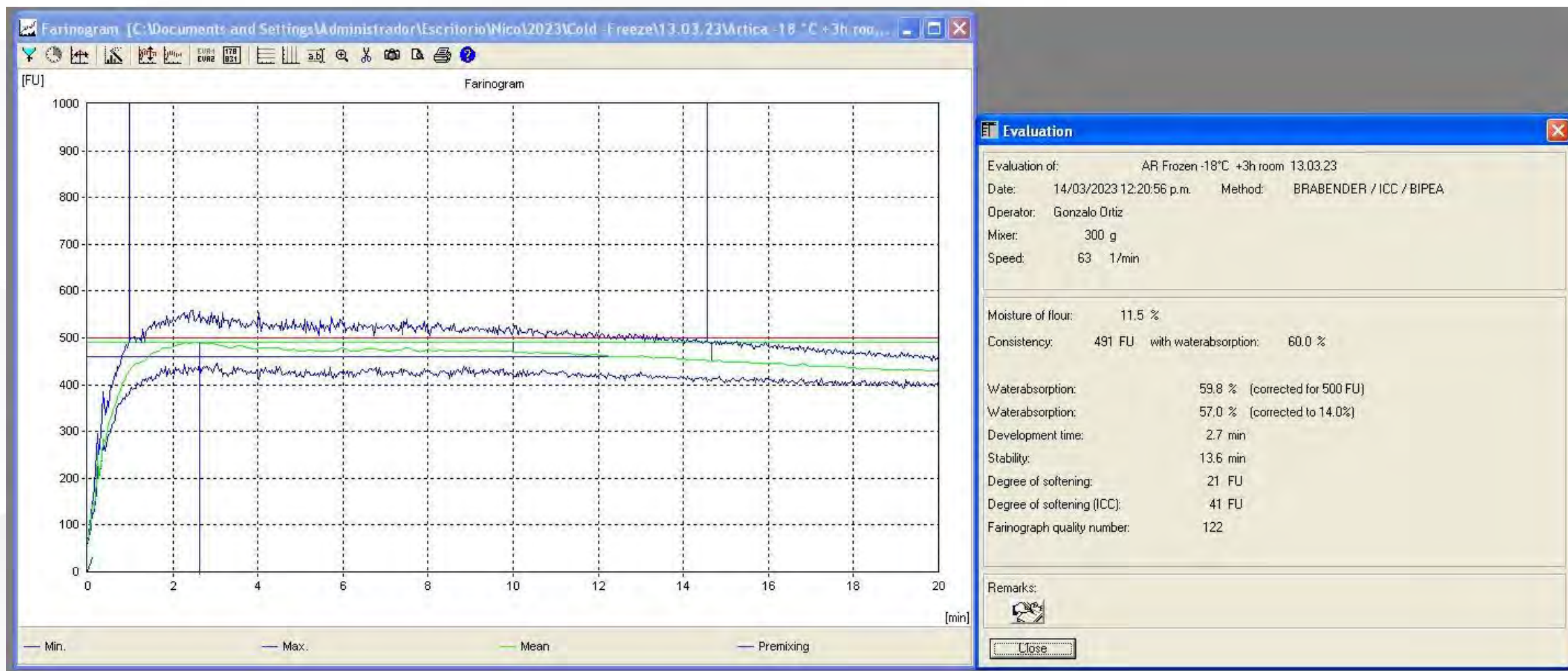
Farinograph

-18°C storage



Farinograph

-18°C + 3hrs room



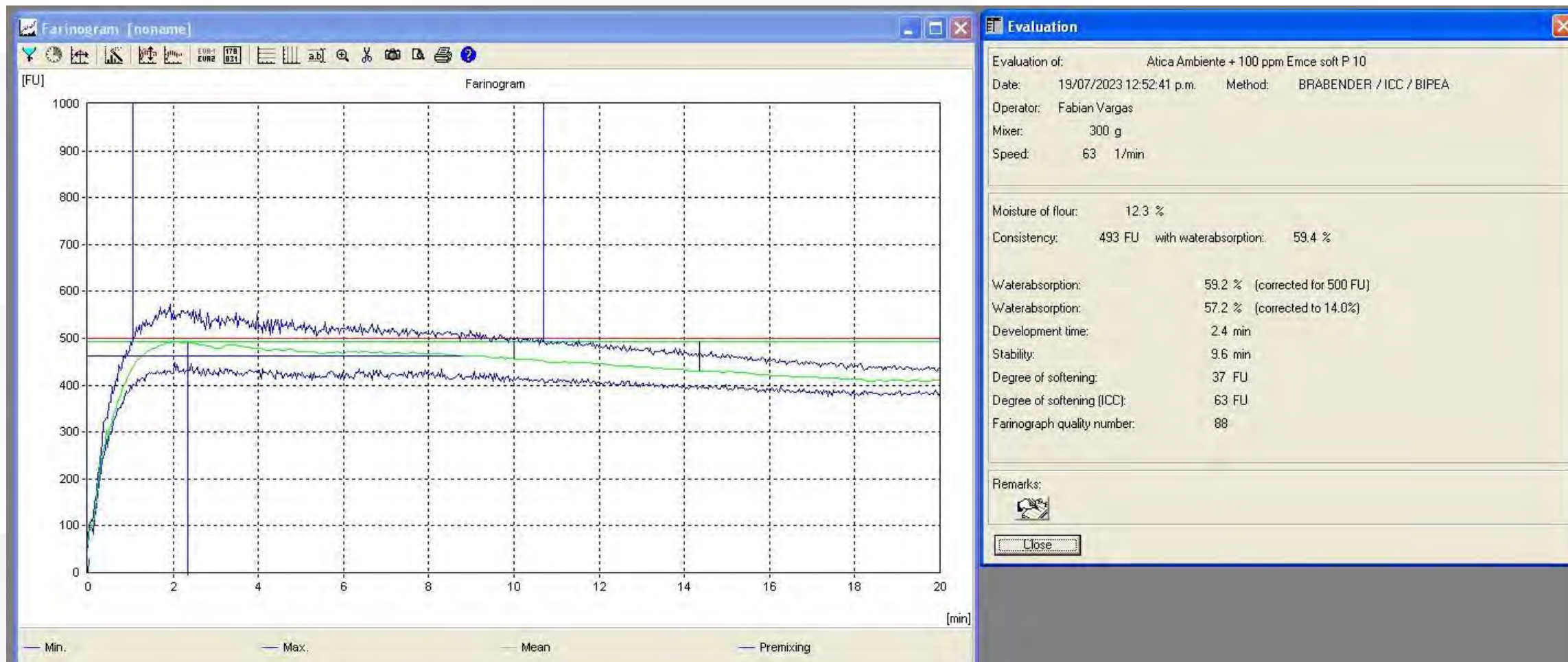
Results

	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	57.5 %	1.9 min	4.5 min
Flour 2°C	60 %	2.5 min	11 min
Flour -18 °C	60.7 %	2.2 min	9.3 min
Flour -18 + 3 hours room	59.8 %	2.7 min	13.6 min

Rheology Farinograph +

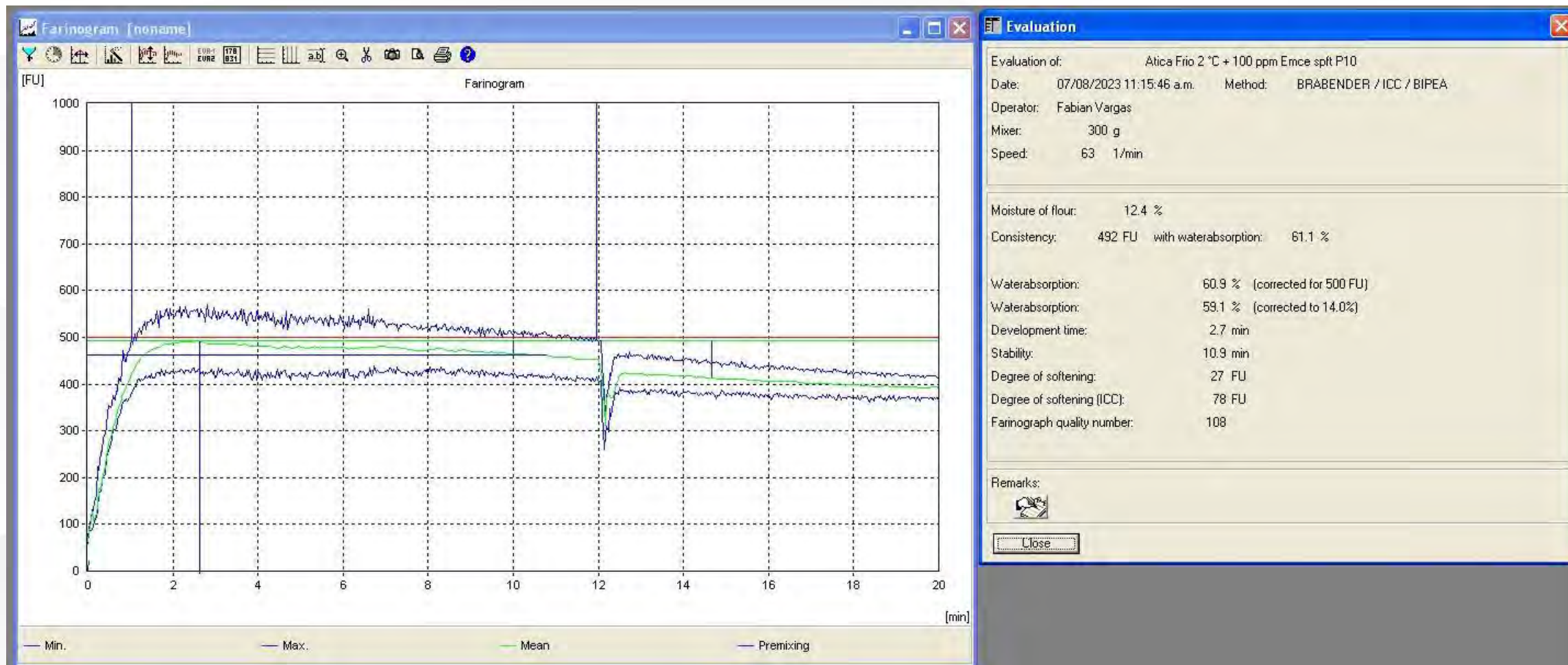
Farinograph

22°C

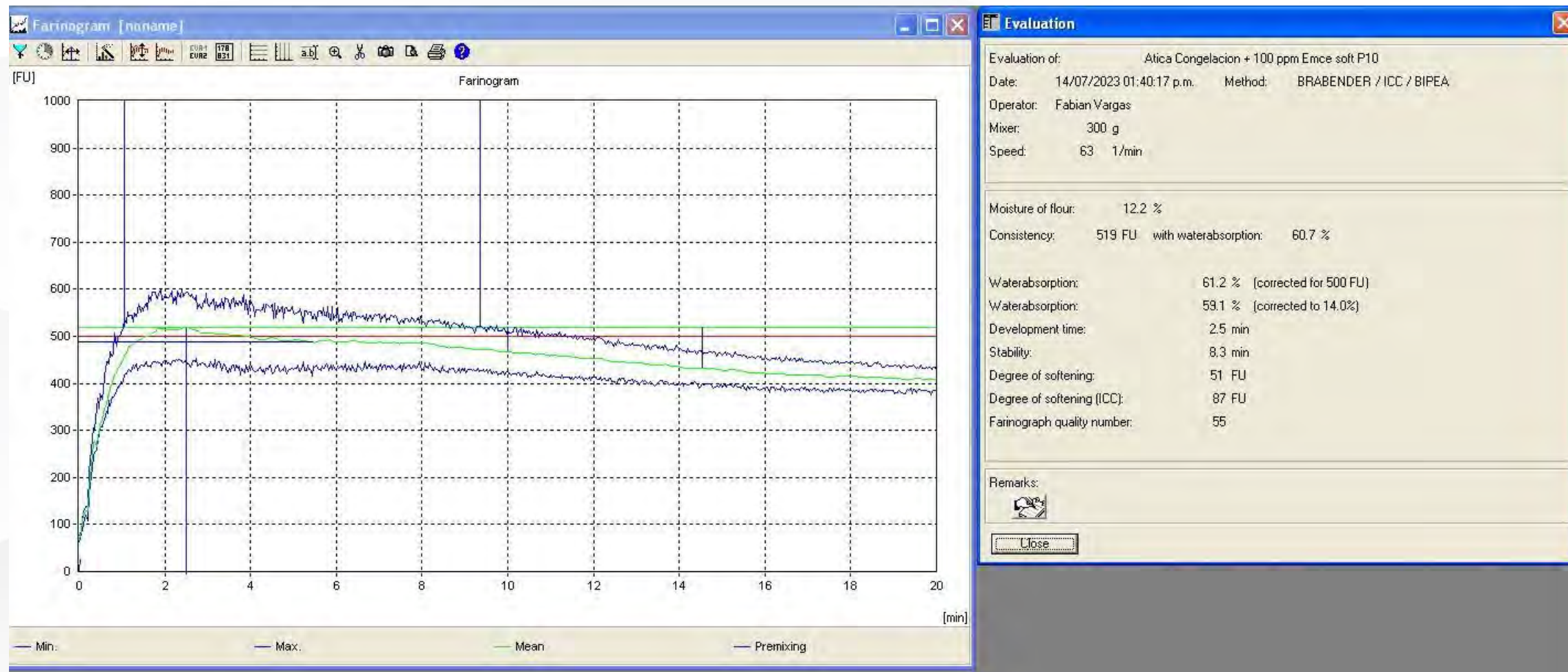


Farinograph

2°C storage

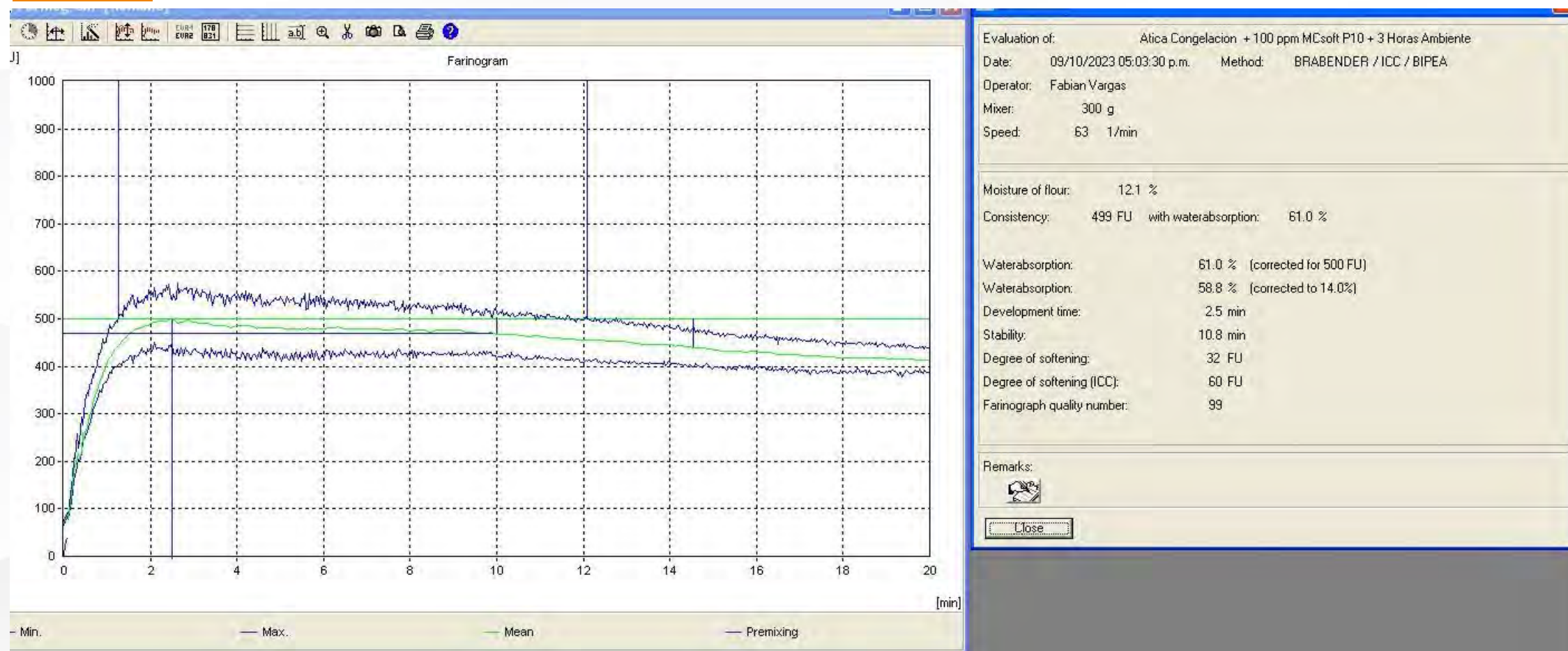


Farinograph -18°C storage



Farinograph

-18°C + 3hrs room

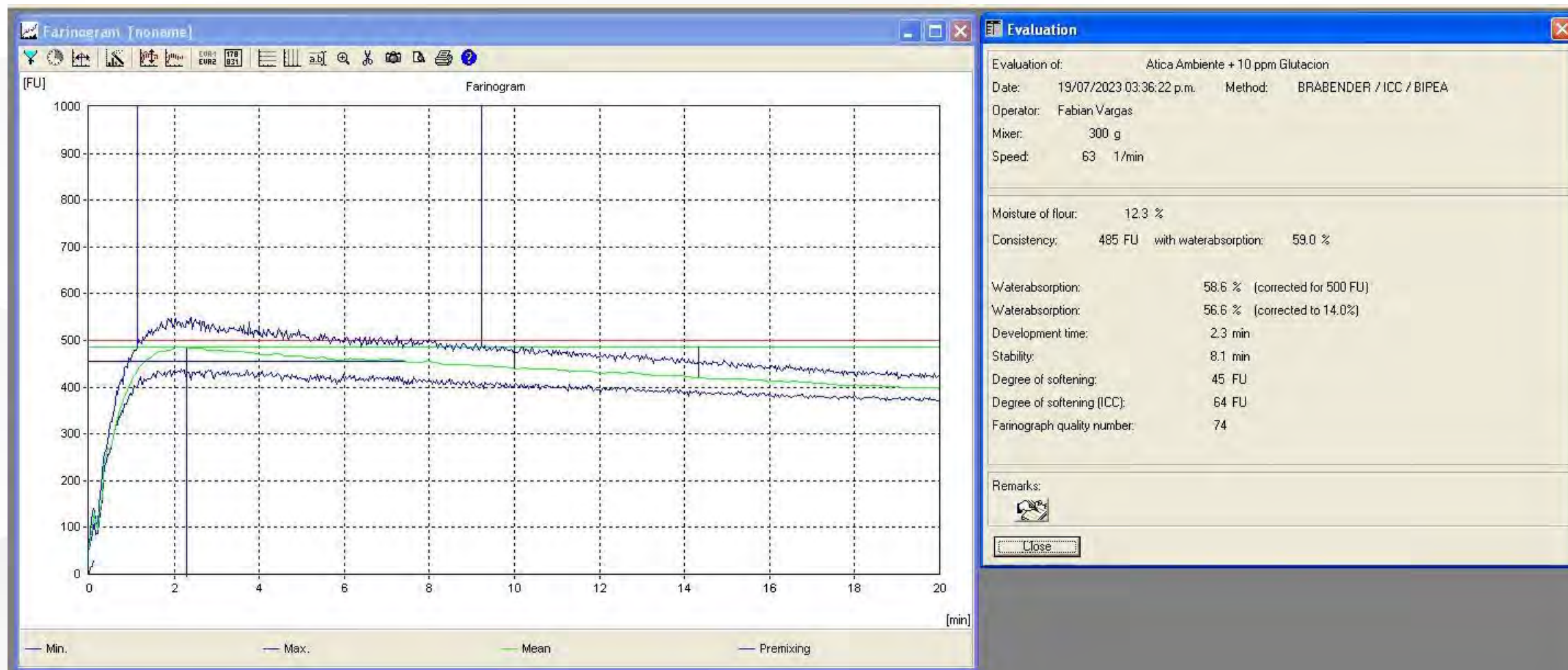


Results

	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	59.2%	2.4 min	9.6 min
Flour 2°C	60.9 %	2.7 min	10.9 min
Flour -18 °C	61.2 %	2.5 min	8.3 min
Flour -18 + 3 hours room	61.0 %	2.5 min	10.8 min

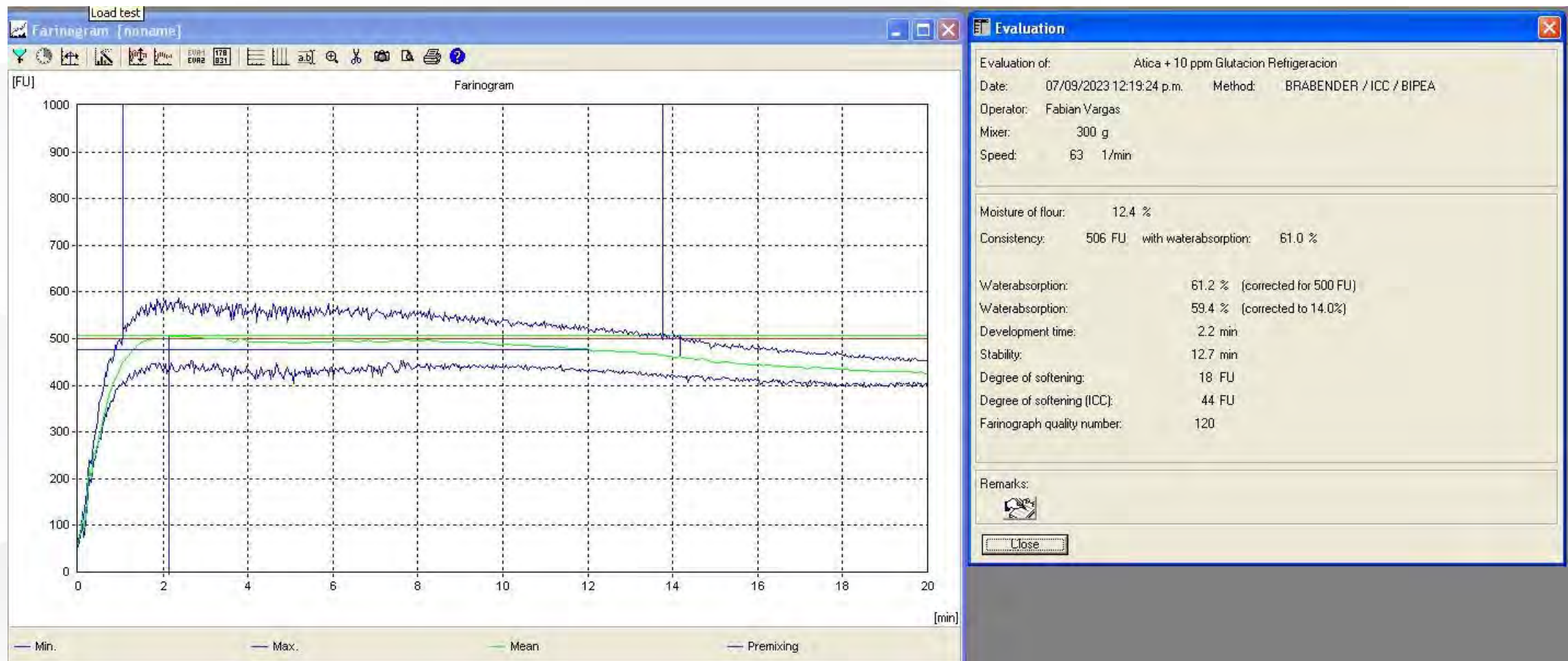
Farinograph

22°C



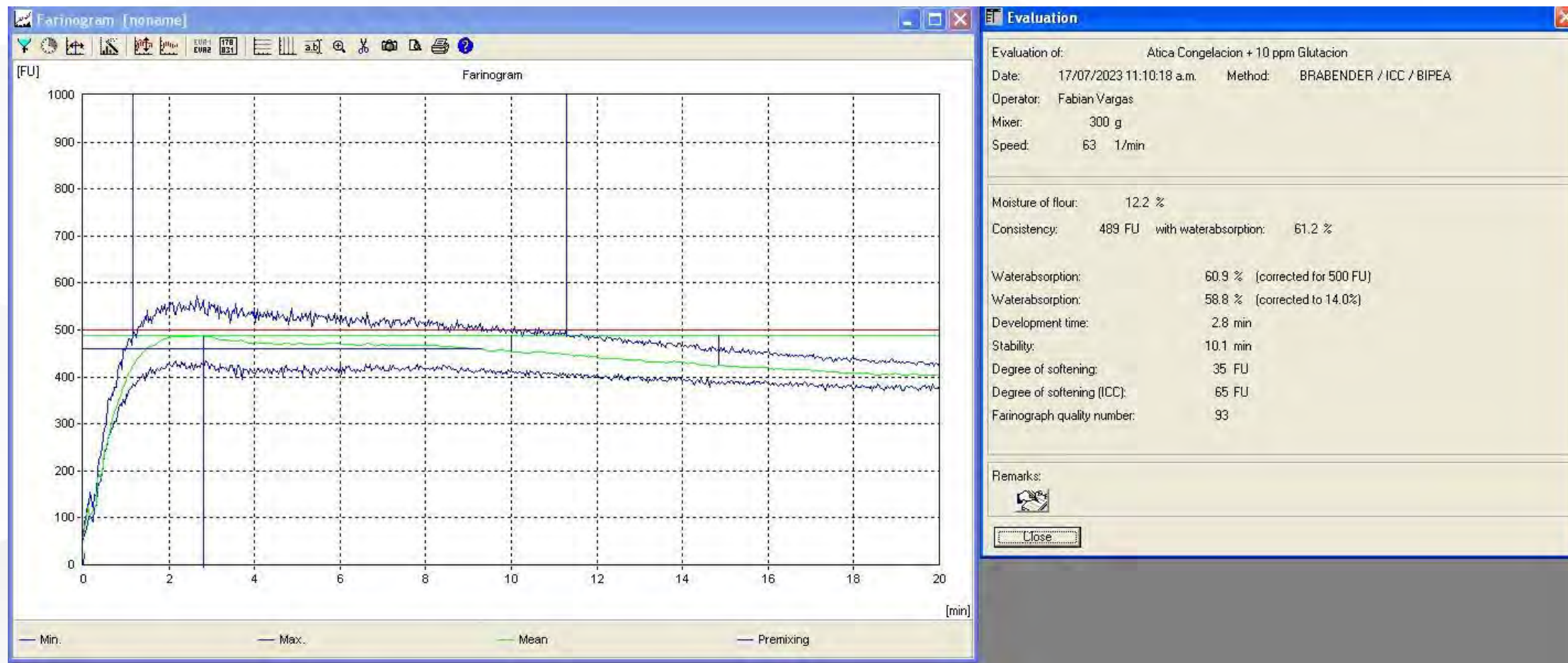
Farinograph

2°C storage



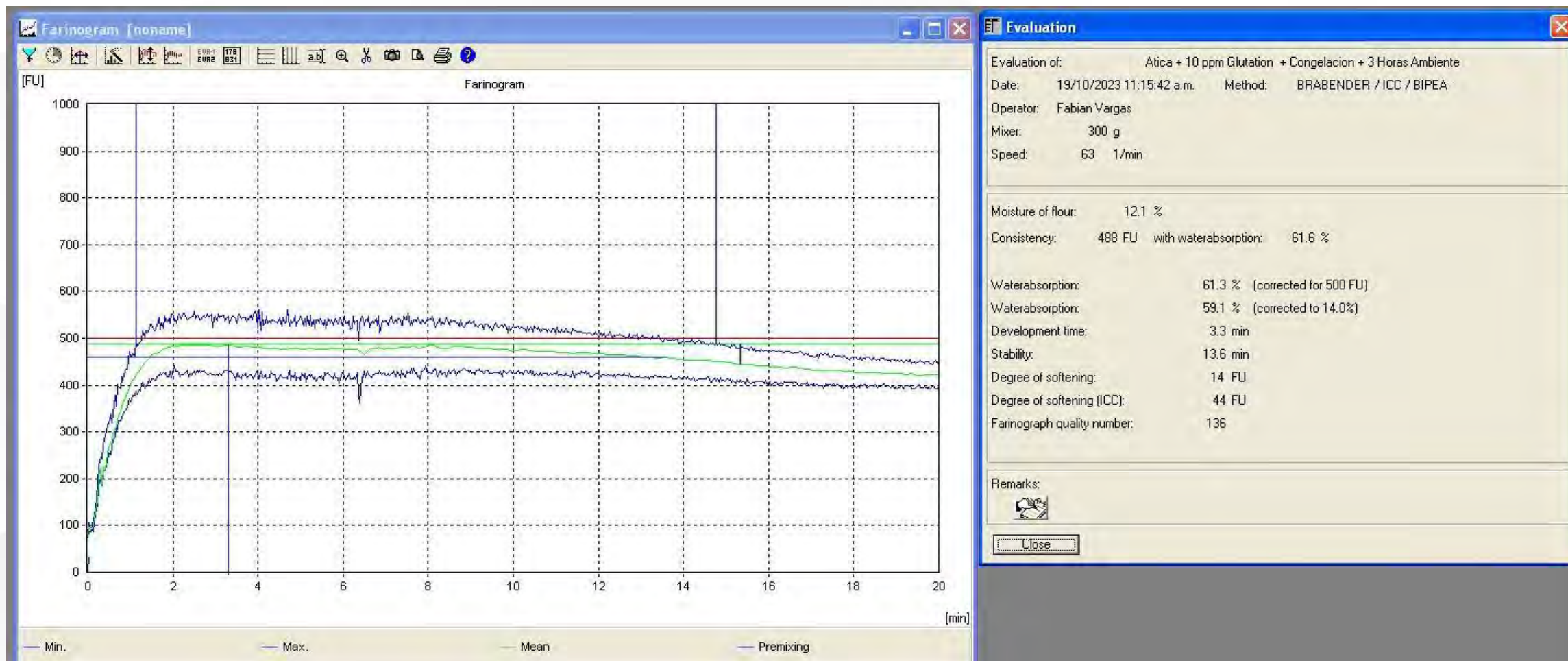
Farinograph

-18°C storage



Farinograph

-18°C + 3hrs room

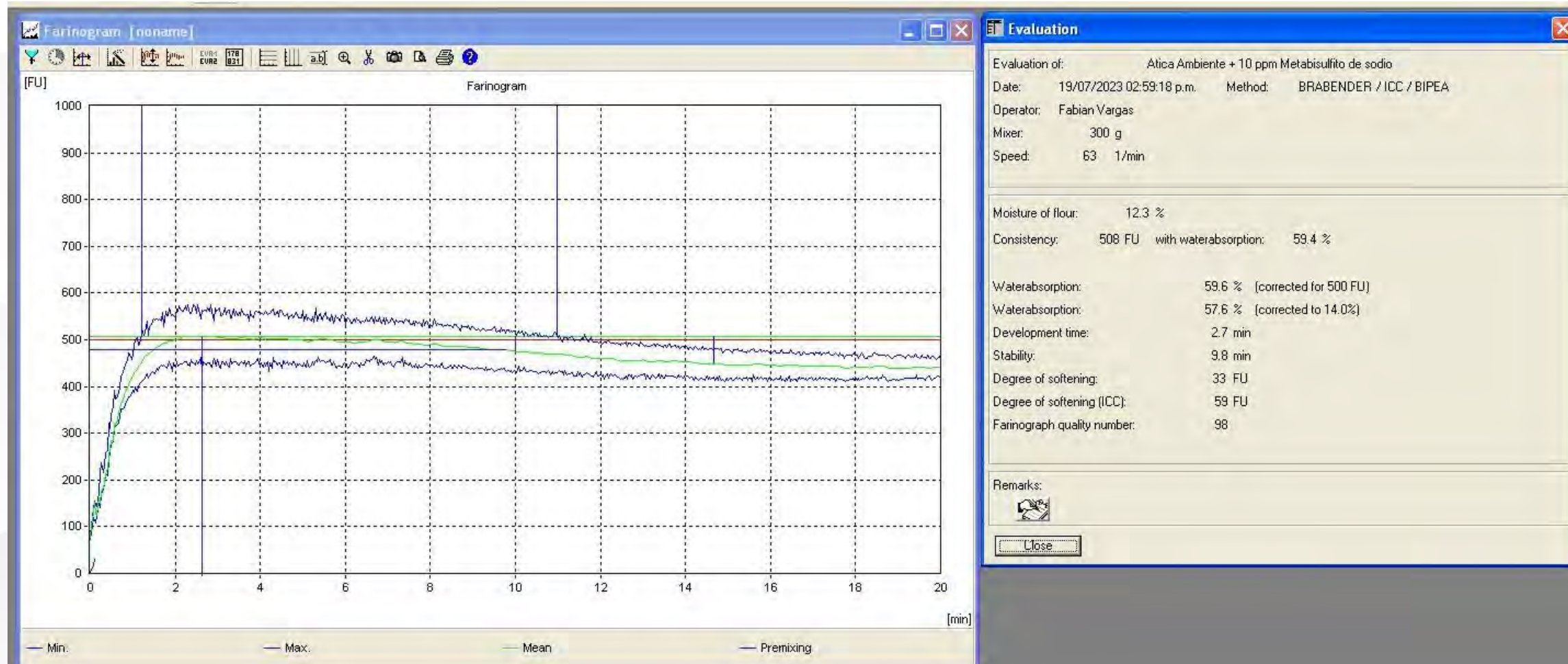


Results

	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	58.6 %	2.3 min	8.1 min
Flour 2°C	61.2 %	2.2 min	12.7 min
Flour -18 °C	60.9 %	2.8 min	10.1 min
Flour -18 + 3 hours room	61.3 %	3.3 min	13.6 min

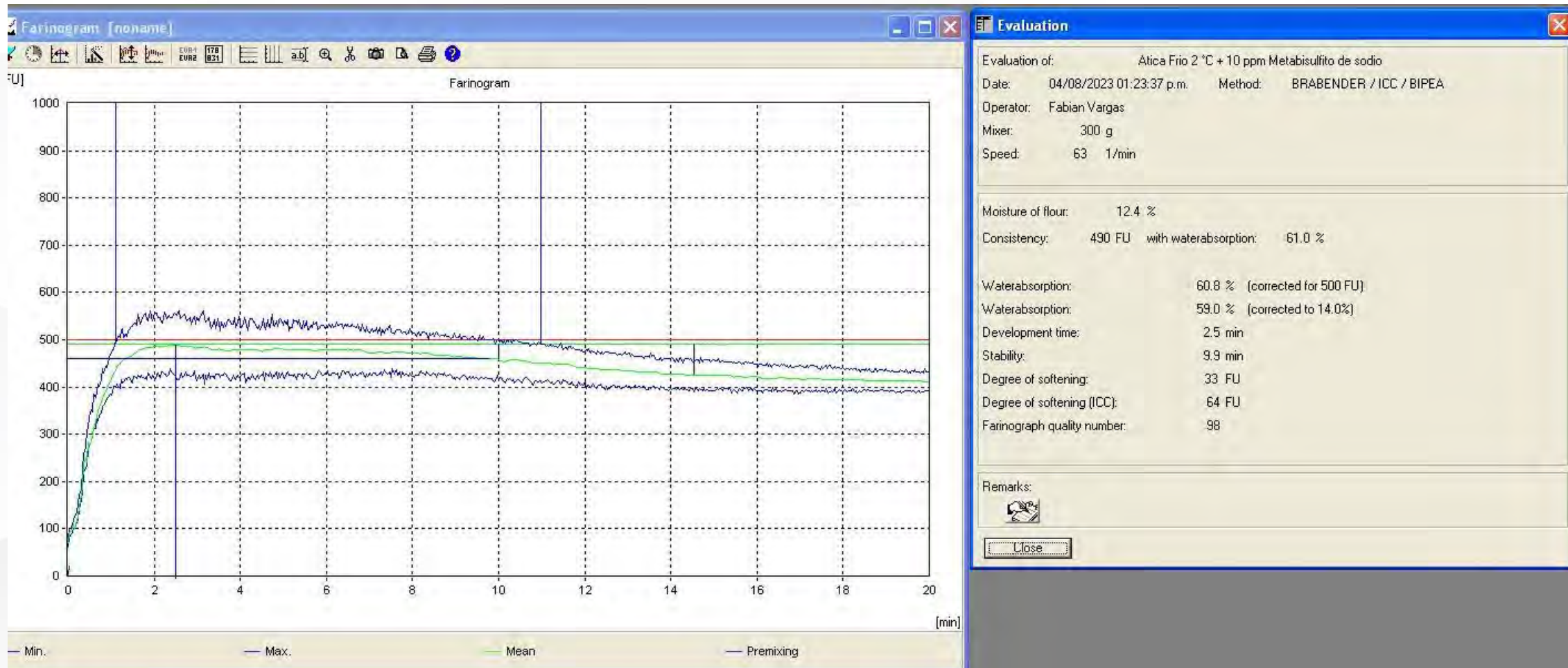
Farinograph

22°C



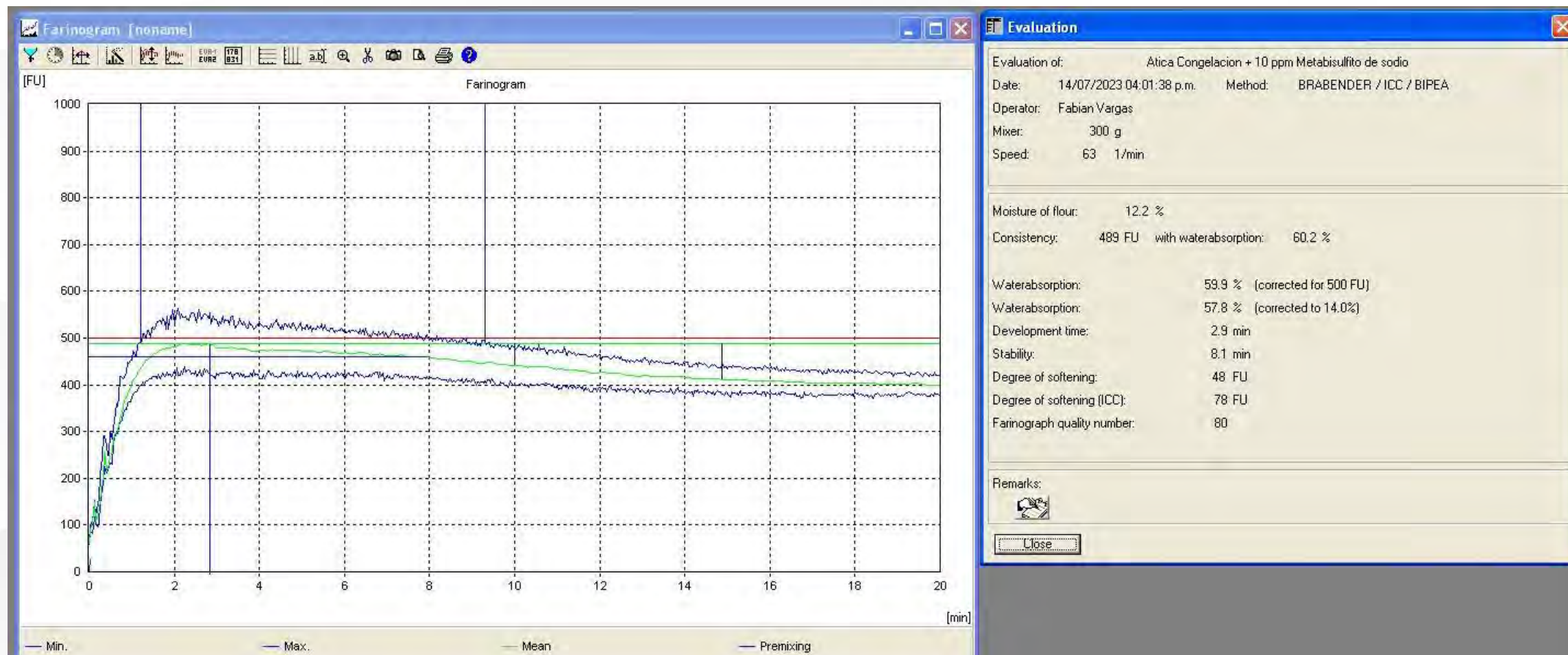
Farinograph

2°C storage



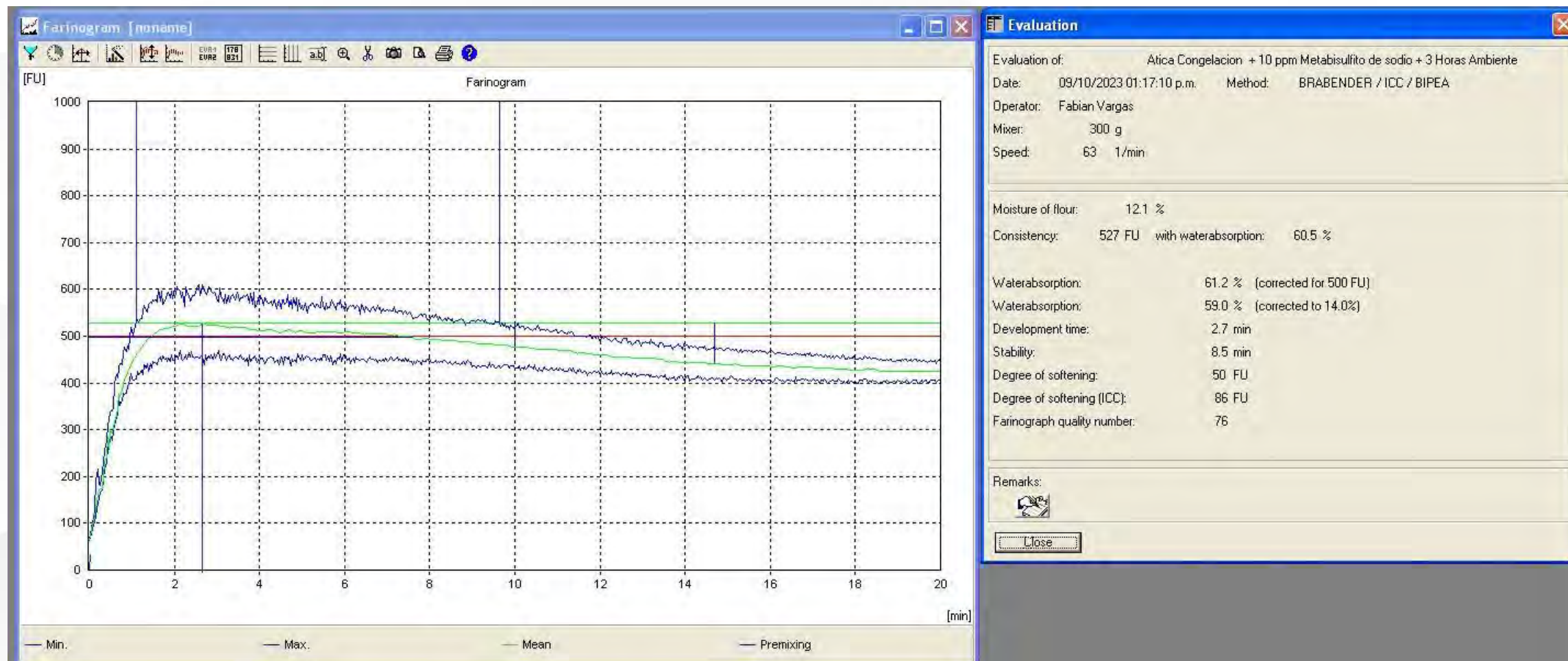
Farinograph

-18°C storage



Farinograph

-18°C + 3hrs room

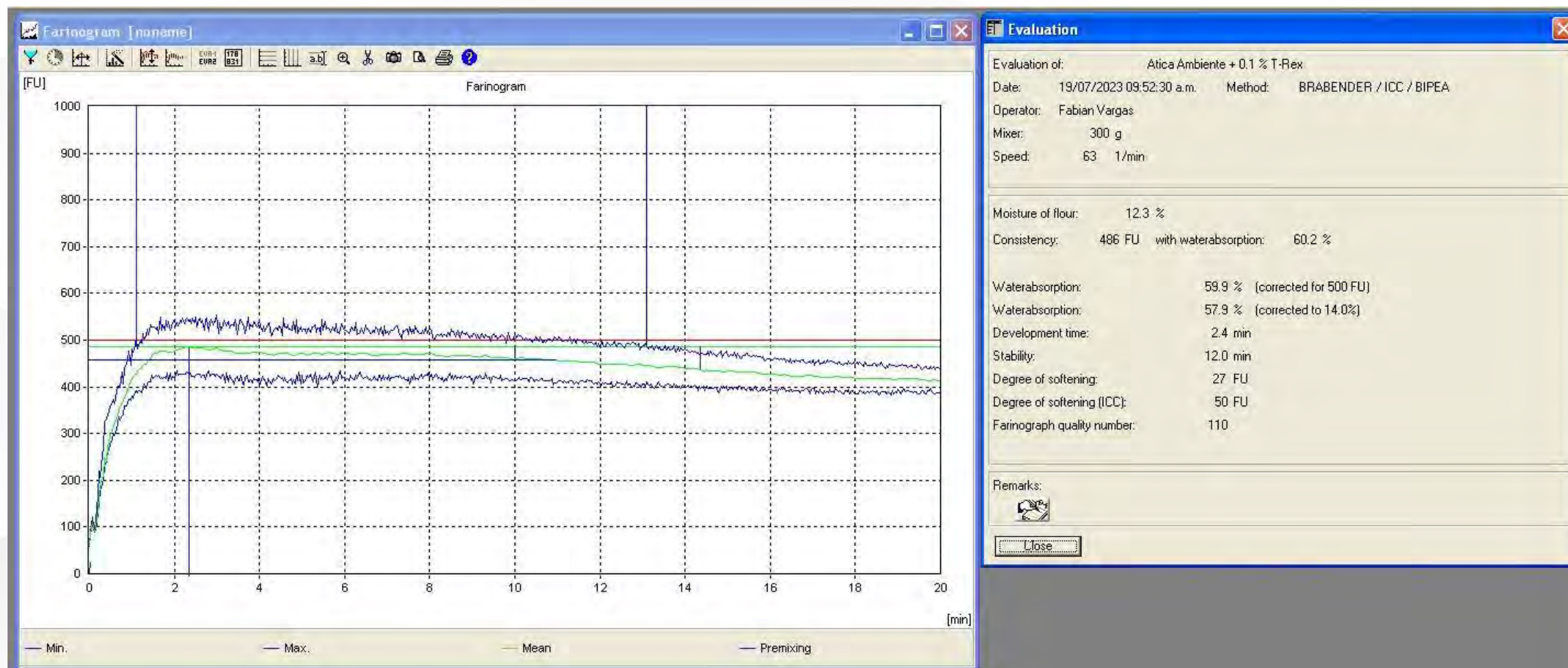


Results

	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	59.6 %	2.7 min	9.8 min
Flour 2°C	60.8 %	2.5 min	9.9 min
Flour -18 °C	59.9 %	2.9 min	8.1 min
Flour -18 + 3 hours room	61.2 %	2.7 min	8.5 min

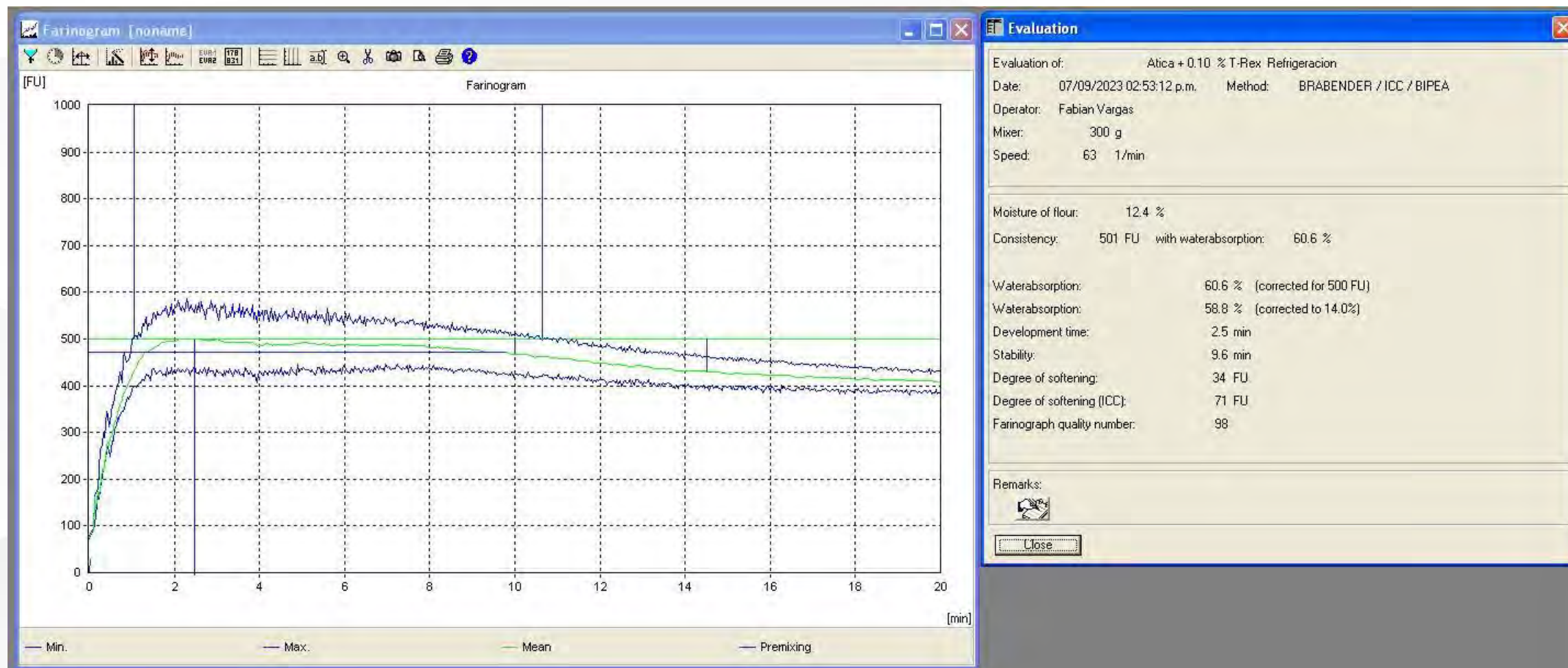
Farinograph

22°C

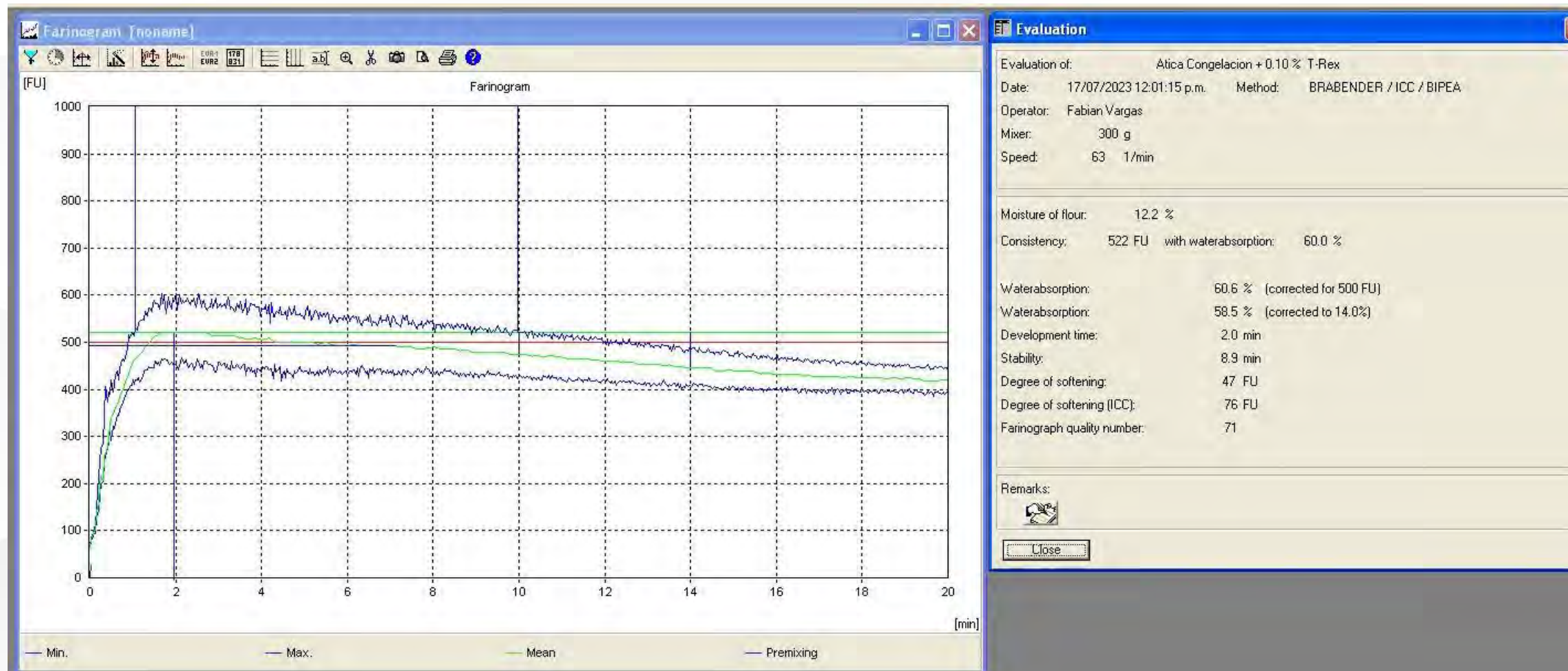


Farinograph

2°C storage

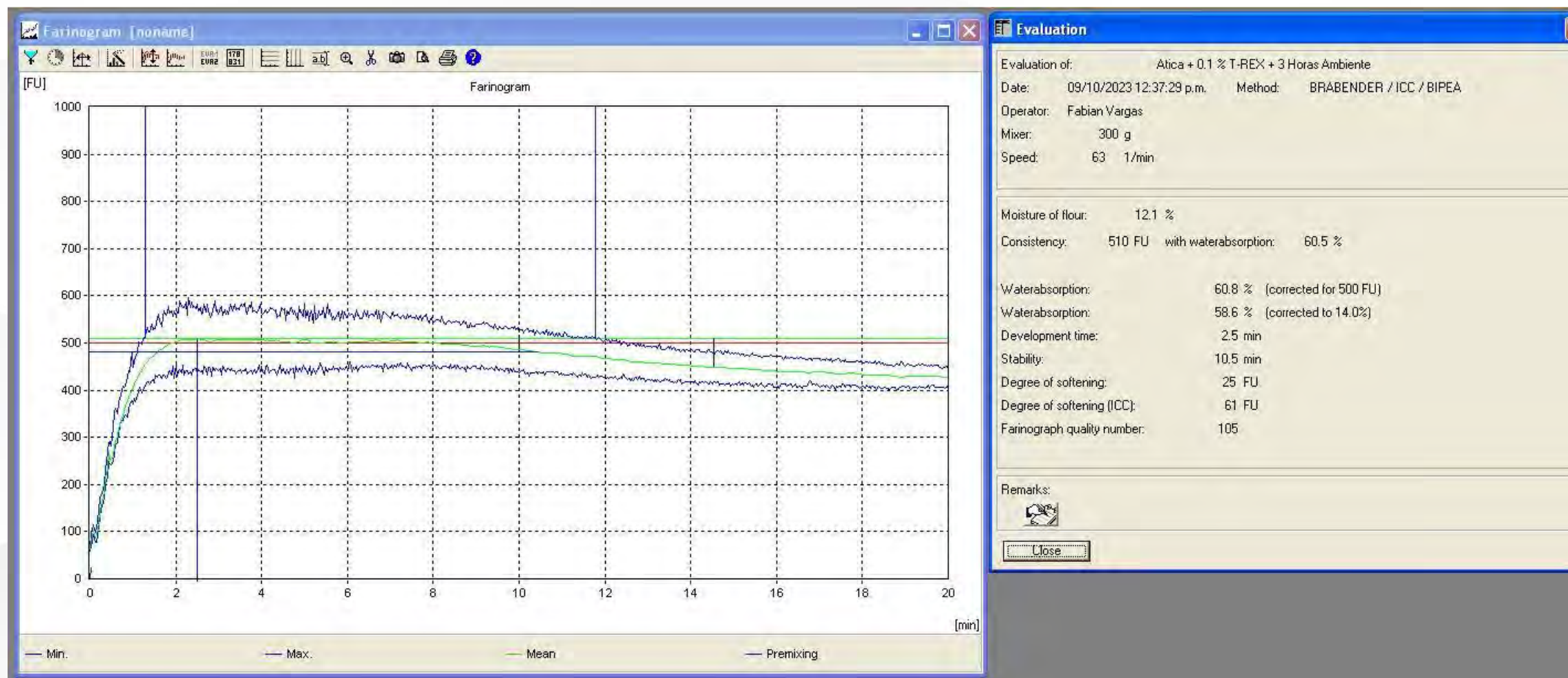


Farinograph -18°C storage



Farinograph

-18°C + 3hrs room



Results

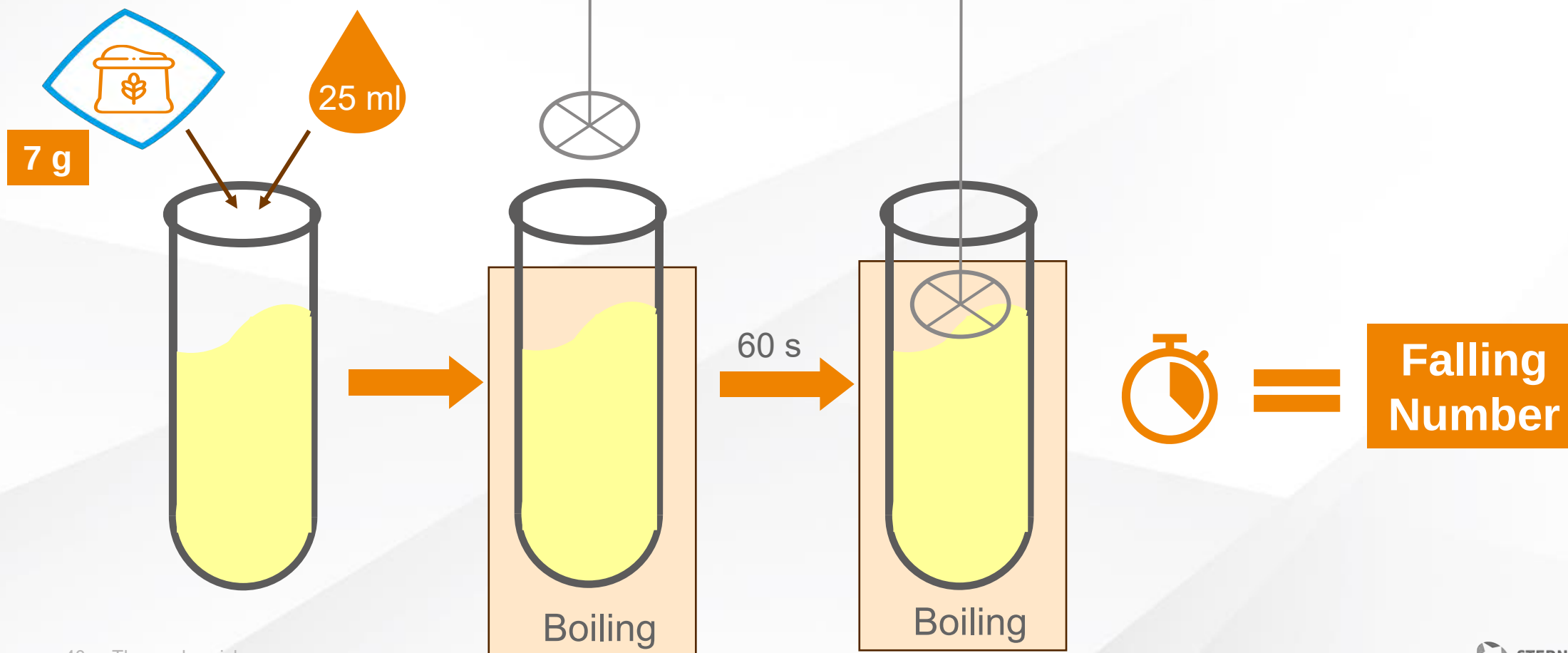
	Water absorption Corrected 500FU	Development time	Stability
Flour room 22°C	59.9 %	2.4 min	12.0 min
Flour 2°C	60.6 %	2.5 min	9.6 min
Flour -18 °C	60.6 %	2.0 min	8.9 min
Flour -18 + 3 hours room	60.8 %	2.5 min	10.5 min

Rheology

Falling number

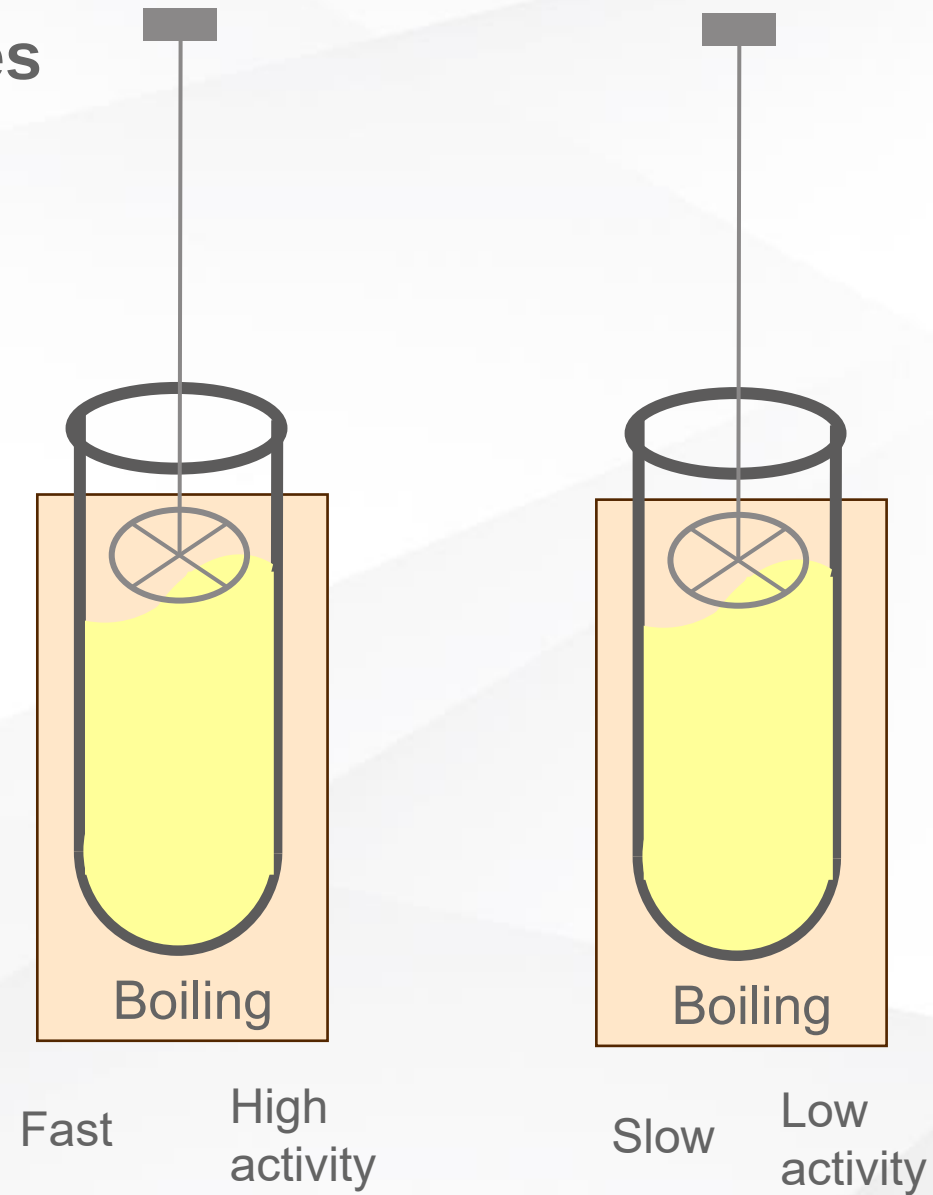
Principle

Falling number



Interpreting the values

Falling Number



Results

	Falling number	Falling number
Flour RoomTemp	541	465
Flour 2°C	459	446
Flour -18 °C	487	410
Flour -18 + 3 hours room	280	268

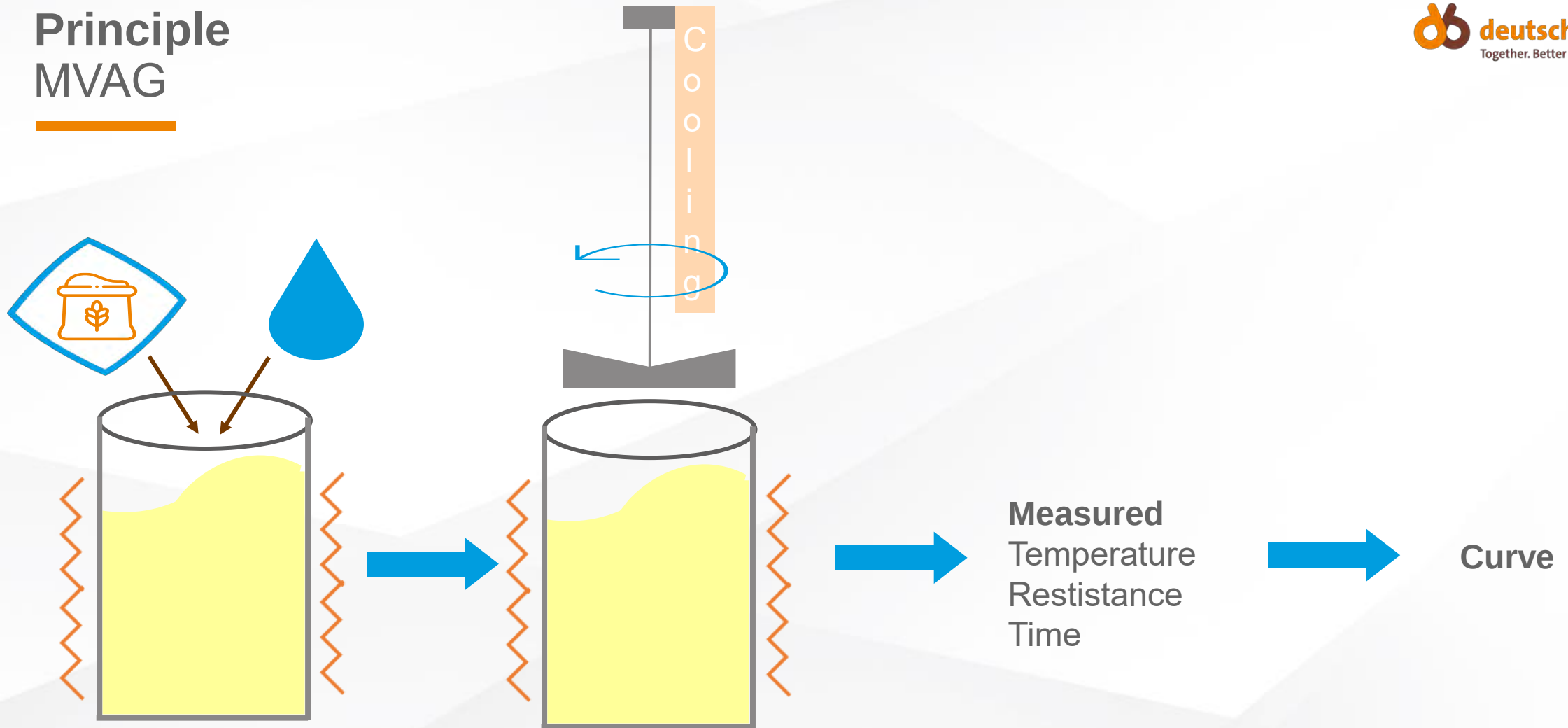
Rheology Viscograph

Micro-Visco Amylograph

- Flour suspension
- Heating and cooling
- Retrogradation – freshkeeping

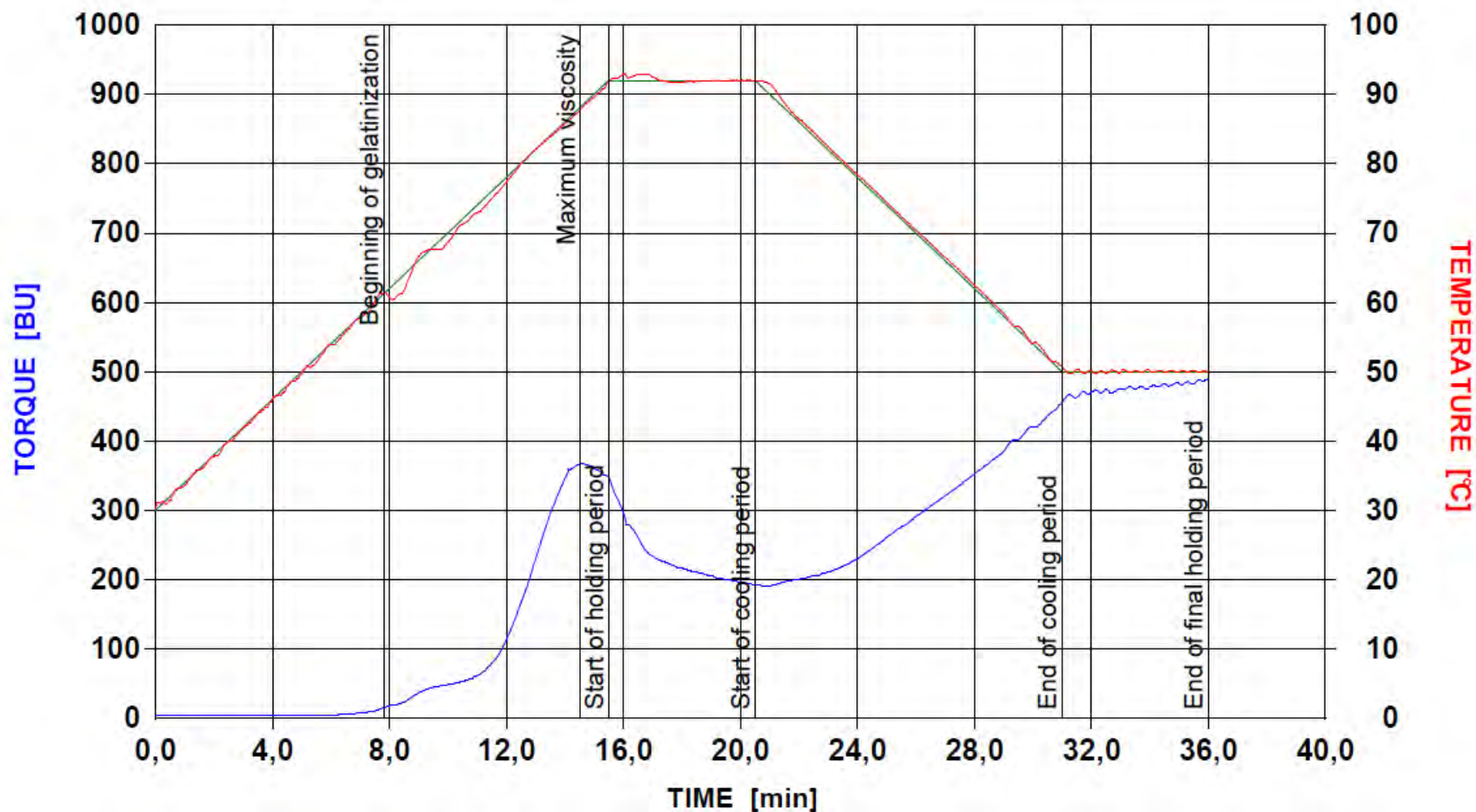


Principle MVAG



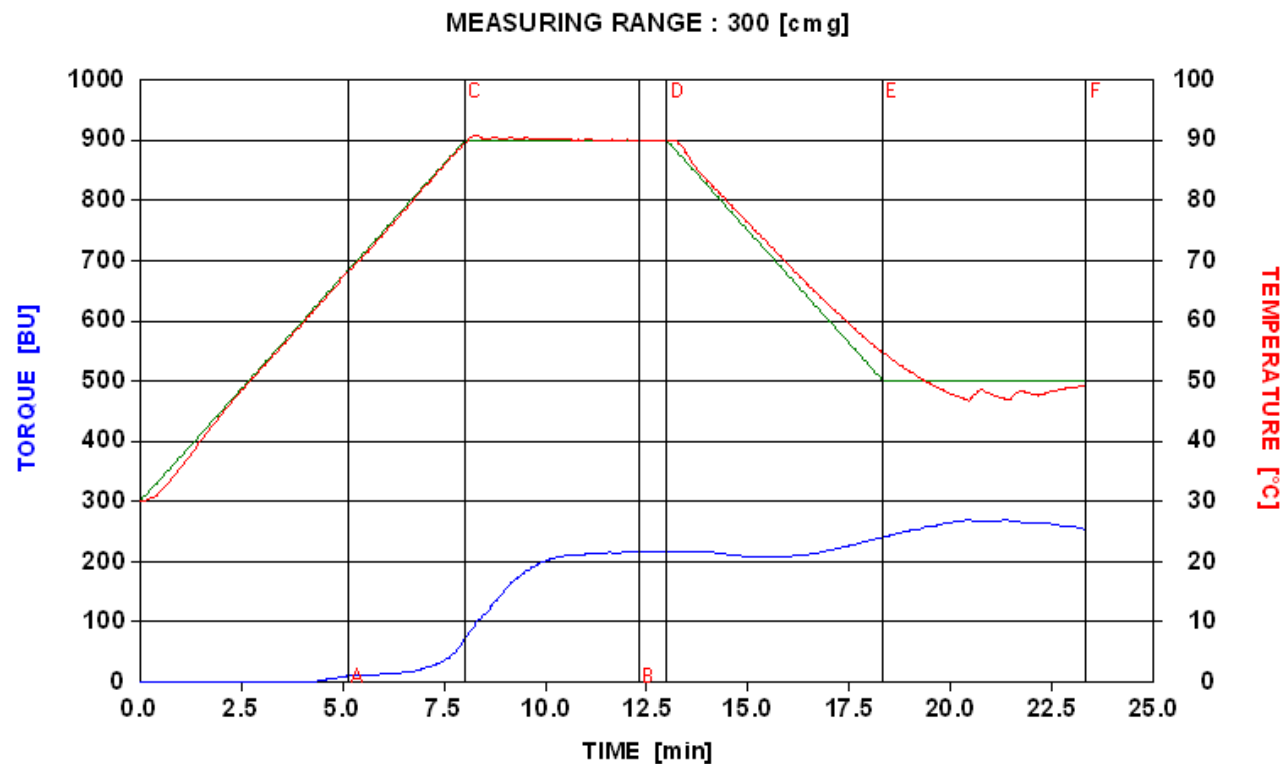
Interpreting the curve

MVAG



Micro-Visco Amylograph

Flour normal

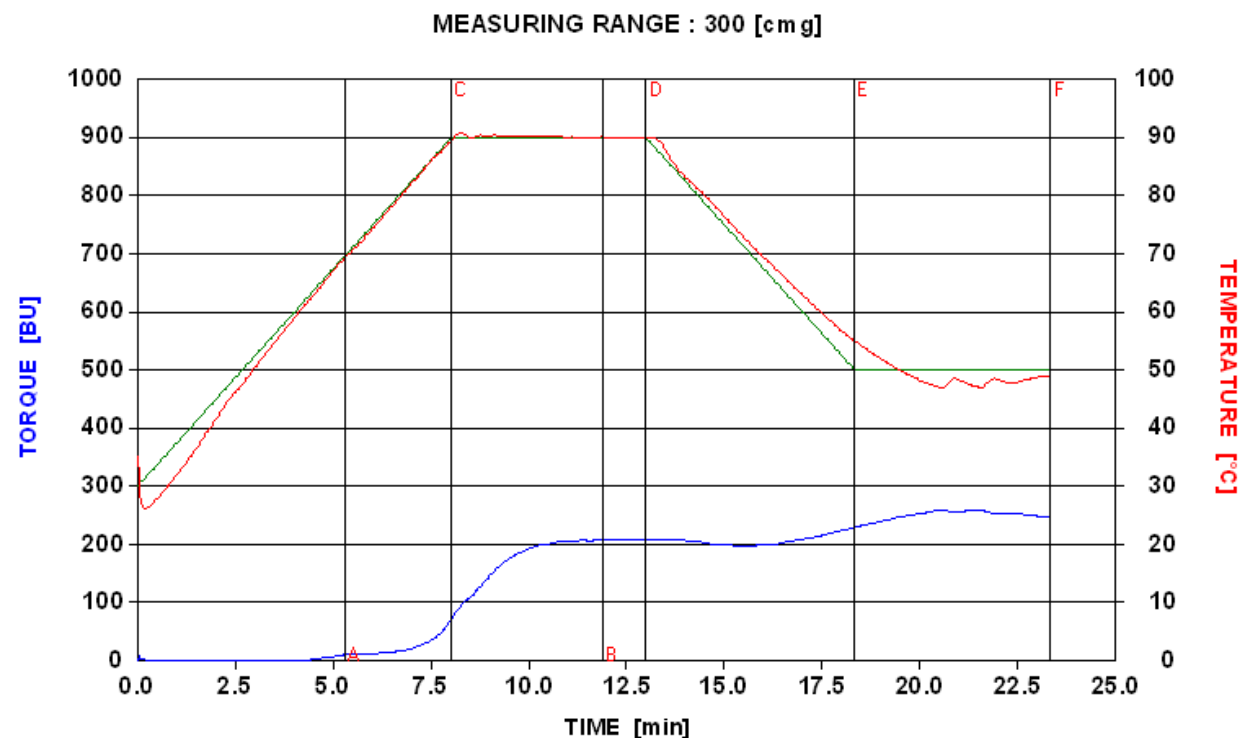


Evaluation

Point	Name	Time [HH:MM:SS]	Torque [BU]	Temperature [°C]
A	Beginning of gelatinization	00:05:08	10	68.3
B	Maximum viscosity	00:12:18	217	90.0
C	Start of holding period	00:08:00	72	89.5
D	Start of cooling period	00:13:00	216	90.0
E	End of cooling period	00:18:20	241	54.7
F	End of final holding period	00:23:20	254	49.2
B-D	Breakdown		1	
E-D	Setback		25	

Micro-Visco Amylograph

2°C storage

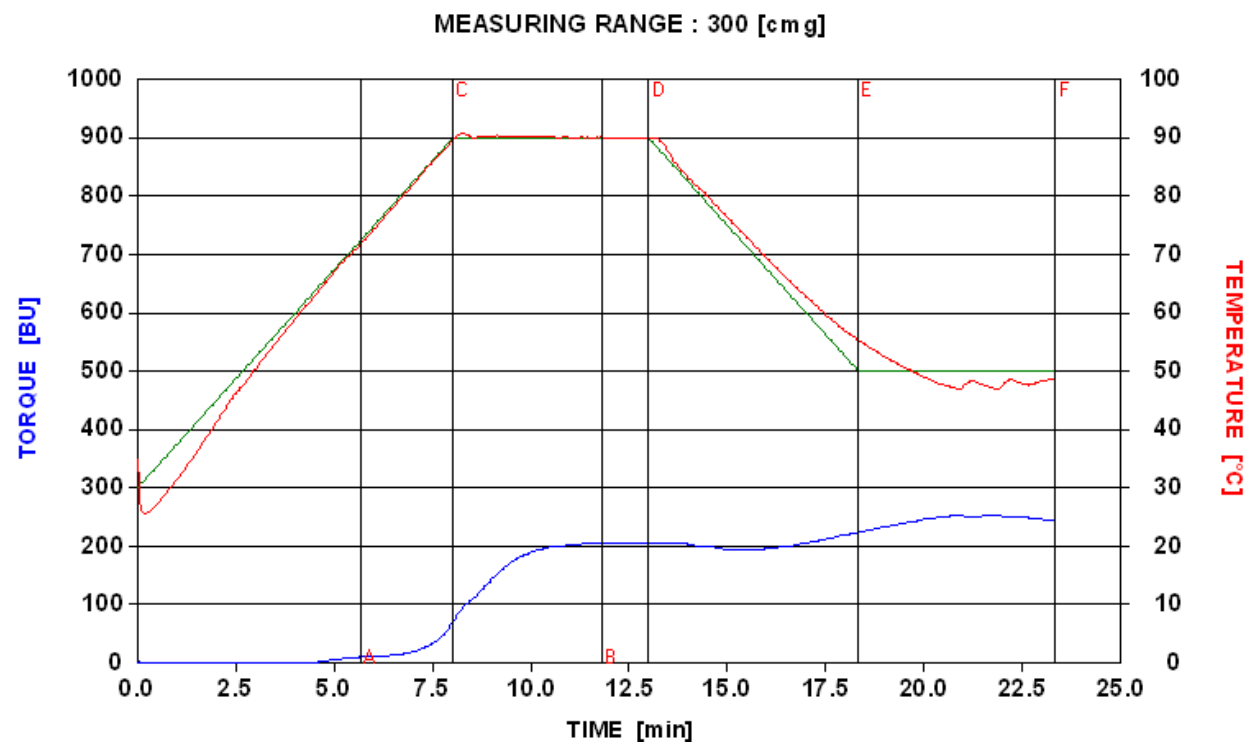


Evaluation

Point	Name	Time [HH:MM:SS]	Torque [BU]	Temperature [°C]
A	Beginning of gelatinization	00:05:18	10	69.4
B	Maximum viscosity	00:11:52	208	90.0
C	Start of holding period	00:08:00	71	89.5
D	Start of cooling period	00:13:00	208	90.0
E	End of cooling period	00:18:20	229	55.0
F	End of final holding period	00:23:20	246	49.1
B-D	Breakdown		0	
E-D	Setback		21	

Micro-Visco Amylograph

-18°C storage

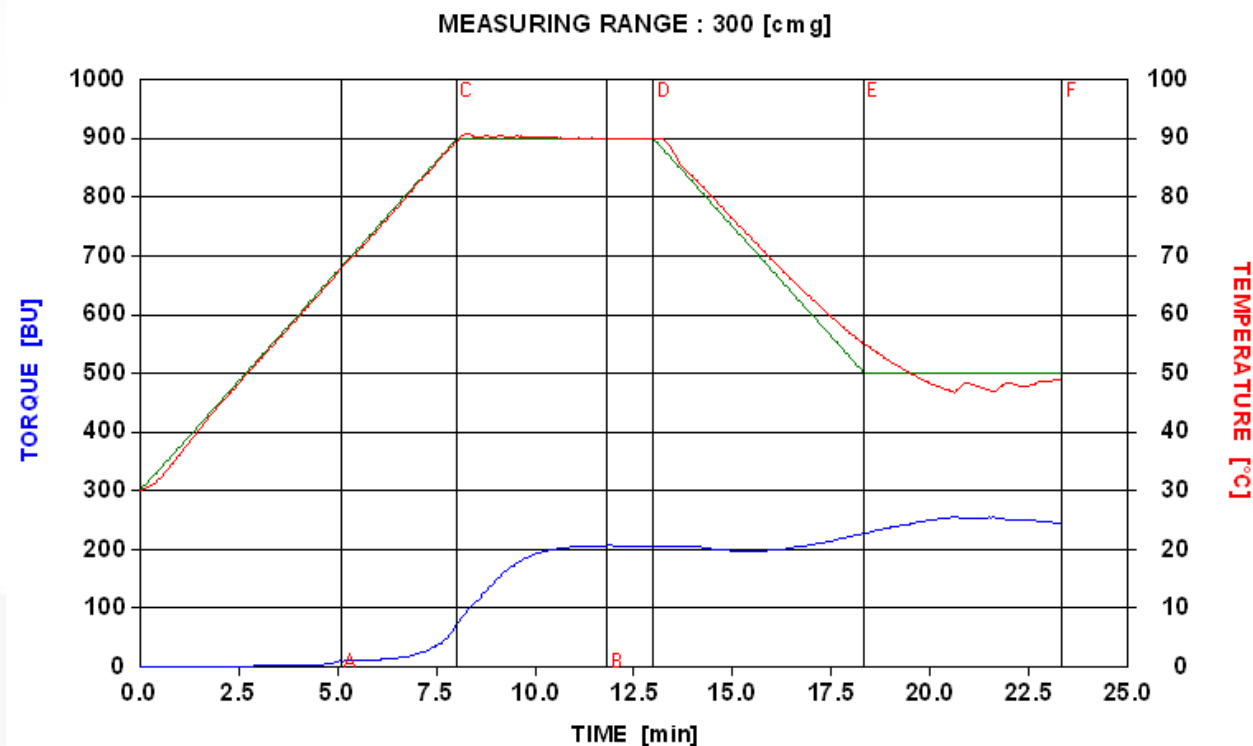


Evaluation

Point	Name	Time [HH:MM:SS]	Torque [BU]	Temperature [°C]
A	Beginning of gelatinization	00:05:40	10	71.9
B	Maximum viscosity	00:11:46	205	90.1
C	Start of holding period	00:08:00	70	89.6
D	Start of cooling period	00:13:00	204	90.0
E	End of cooling period	00:18:20	224	55.3
F	End of final holding period	00:23:20	243	48.8
B-D	Breakdown		1	
E-D	Setback		20	

Micro-Visco Amylograph

-18°C + 3hrs room



Evaluation

Point	Name	Time [HH:MM:SS]	Torque [BU]	Temperature [°C]
A	Beginning of gelatinization	00:05:04	9	67.9
B	Maximum viscosity	00:11:48	207	90.0
C	Start of holding period	00:08:00	72	89.5
D	Start of cooling period	00:13:00	205	90.0
E	End of cooling period	00:18:20	227	55.1
F	End of final holding period	00:23:20	244	49.1
B-D	Breakdown		2	
E-D	Setback		22	

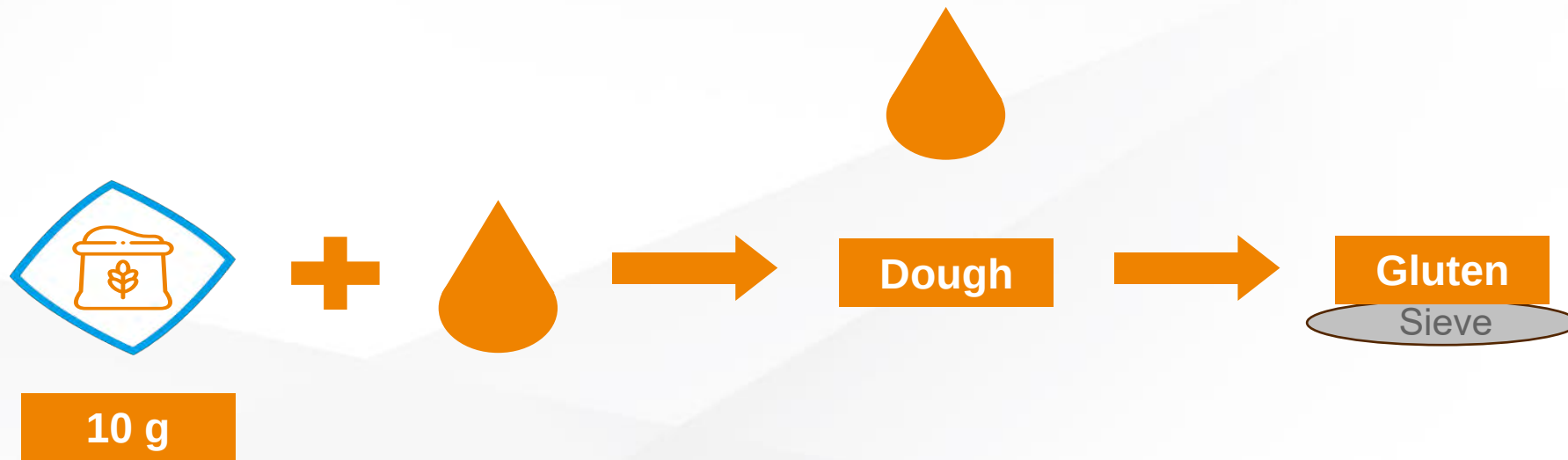
Rheology Gluten

Gluten Index



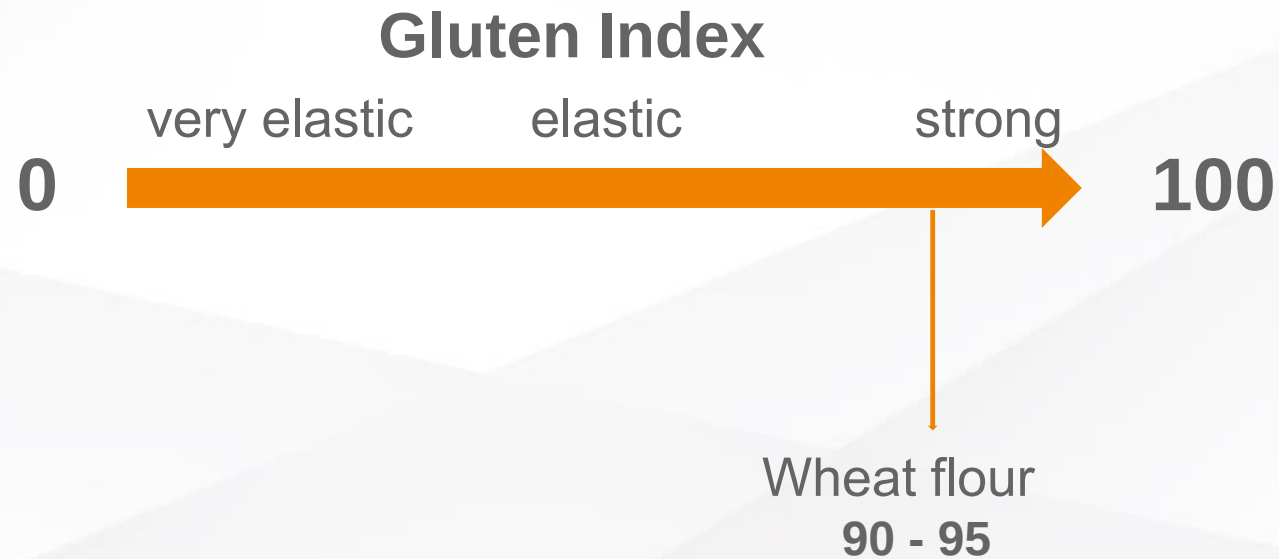
Principle

Gluten Index



Interpreting the curve

Gluten Index



Sieve

Results

	Wet Gluten	Gluten Index	Dry Gluten
Flour room 22°C	31.1 %	88	10.2 %
Flour 2°C	30.8 %	85	10.4 %
Flour -18 °C	31.4 %	90	10.5 %
Flour -18 + 3 hours room	31.1 %	90	10.4 %

Baking

Tortilla

Ingredients	%
Flour	100
TopBake TFX 100	0.1
Salt	2
Sugar	0.5
Acids	0.4
Calcium Propionate	0.8
Baking powder	2
Shorting	12
Water	58

Production	
Mixing	2 + 12 min
Dough Temp	26°C - 27 °C
Resting time	12 min
Press Temp	210°C
Press time	1.4 Sec
Pressure	700 PSI

Tortilla

+ 22°C

Characteristics	
Dough Temperature	26°C
Dough after mixing	Soft, elastic and not sticky
Dough before pressing	Elastic, soft, a little wet
Comments	Good dough, good press characteristics



Tortilla

+ 2°C

Characteristics	
Dough Temperature	26.2°C
Dough after mixing	Soft, slightly sticky and little bucky
Dough before pressing	Overall ok, a little bucky
Comments	Decent press characteristics, slightly uneven



Tortilla

- 18°C

Characteristics	
Dough Temperature	25.8°C
Dough after mixing	Sticky, tough and bucky
Dough before pressing	Bucky and not relaxed
Comments	Very uneven form and slightly yellow



Tortilla

- 18°C +3H

Characteristics	
Dough Temperature	26.4°C
Dough after mixing	Short, little sticky
Dough before pressing	Bucky
Comments	Uneven press More pillowing



Tortilla



+ 22°C

+ 2°C

-18°C

-18°C +3H



Thank you very much for your attention
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R&D

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