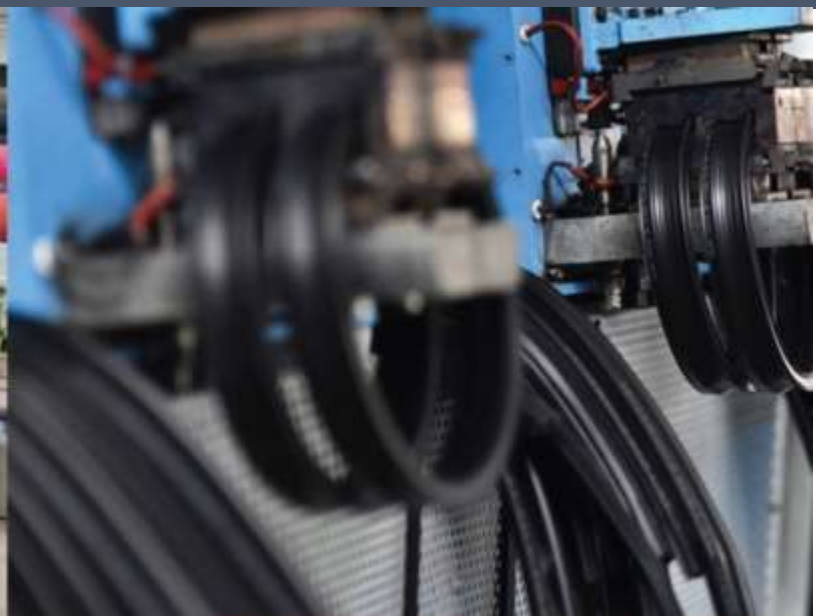


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**Batch Microwave + Convection Heat
Treatment for Brown Sugar**



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Customer :	M/s. E.I.D Parry Ltd.
Process :	Batch Microwave + Convection Heat Treatment for Brown Sugar

Test Report No: 120/KRDC/LAB/17 Mum 05/08/2022

Date Sample reception : 01/08/2022
ID : 120/LAB/05

Sample Description:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : approx. (20-21) kg - used 1kg each
Sampling date : 04/08/2022
Product : Brown Sugar
Requirement : Moisture reduction below 1%
Start Date test : 04/08/2022
End Date test : 05/08/2022

Objective – To Reduce the Moisture Content from Brown Sugar to avoid Sugar Caking.

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Laboratory Experimental System –



System Specifications -

Microwave Power	2 KW (CW)
Frequency	2450 MHz \pm 50
Convective Power	3.5 KW (airflow 350 l/min at 20°C)
Microwave Exposure Zone (Cavity)	1 Cubic meter
Mode Stirrer	One
Thermal Monitoring System	Single Channel Fiber Optic: Range - 40 to 250°C
Exhaust Power	1 HP
Tray size (width*height*depth)	450*950*50 mm

Format: F/R&D/01

The value obtained is already corrected for possible recover value stated, if applicable. This document may not be reproduced or disclosed wholly or partly in any part thereof without the written consent of the laboratory management or customer. This document relates only to the specimen samples processed. The processed sample will be kept in this laboratory for 7 days from the date of heat treatment.

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Procedure of the Experiment -

- The experiment was performed on wheat to speed up the heating rate.
- For this experimental run, the given sample was taken in the glass tray and placed in MW + Convection heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Product 1

TRIAL-1:

Initial Wt.: 500g

Initial Moisture: 2.4%

Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 10 min	35 °C	Reduction in moisture started
C2	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 20 min	40 °C	Process Continues
C3	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 30 min	45 °C	Process Continues
C4	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 40 min	52 °C	Moisture achieved as desired

Total time: 40 min

Final Wt.: 486 g

Final Moisture: 0.3%

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TRIAL-2:

Initial Wt.: 500g

Initial Moisture: 2.4%

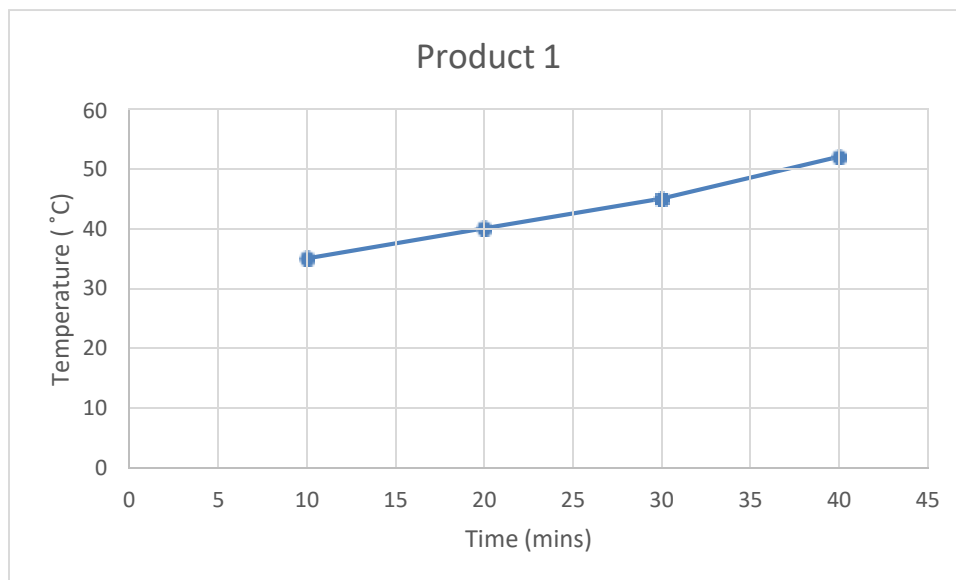
Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW: 45°C; Set temp. of Heater: 50°C; Fan speed: 100%	After 30 min	(40-55)°C	Moisture achieved as desired

Total time: 30 min

Final Wt.: 490 g

Final Moisture: 0.0%

Time Temperature Profile :-





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Product 2

TRIAL-1:

Initial Wt.: 500g

Initial Moisture: 1.7%

Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 10 min	35 °C	Reduction in moisture started
C2	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 20 min	45 °C	Process Continues
C3	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 30 min	53 °C	Process Continues
C4	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 40 min	60 °C	Moisture achieved as desired

Total time: 30 min

Final Wt.: 477 g

Final Moisture: 0.9%

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TRIAL-2:

Initial Wt.: 500g

Initial Moisture: 1.7%

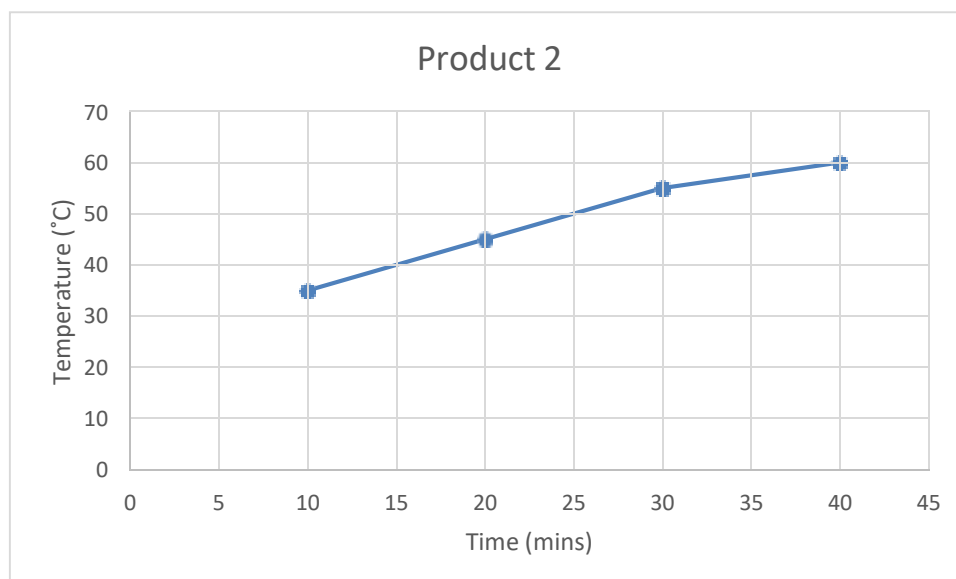
Cycles	Specifications of Microwave	Cycle Time (min.)	On product temp	Remarks.
C1	Magnetron Power: 0.8 kW; Set temp. of MW:45°C; Set temp. of Heater:50°C; Fan speed: 100%	After 30 min	(60-63)°C	Moisture achieved as desired

Total time: 30 min

Final Wt.: 498 g

Final Moisture: 0.5%

Time Temperature Profile:-



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Before and After the Sample:



Untreated Sample product 1



Untreated Sample product 2



Treated Sample (Product 1-Trial 1 & 2 ; Product 2- Trial 1&2)

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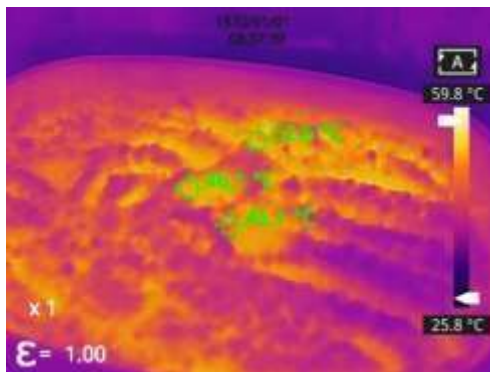
Thermal Images:

Measurements

Sp1	52.6 °C
Sp2	46.1 °C
Sp3	45.1 °C

Parameters

Emissivity	1.00
Temp.	59.8 °C

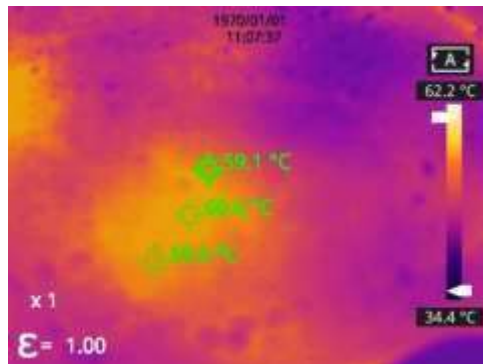


Measurements

Sp1	59.1 °C
Sp2	60.6 °C
Sp3	59.9 °C

Parameters


Emissivity	1.00
Temp.	62.2 °C



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Moisture Analysis Report:

PRODUCT 1

Trial 1		Trial 2	
Drying started		Drying started	
Date : 4-08-2022		Date : 4-08-2022	
Time : 15:45:32		Time : 17:37:14	
Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters	
Product : 0		Product : 0	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode	
Calculation : $((m_0 - m) / m_0) \times 100\%$		Calculation : $((m_0 - m) / m_0) \times 100\%$	
Finished : 3 samples		Finished : 3 samples	
Initial weight : 0.508 g		Initial weight : 0.759 g	
Final weight : 0.496 g		Final weight : 0.757 g	
Drying time : 00:01:40s		Drying time : 00:01:20s	
Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 2.4 %		Moisture : 0.3 %	
NOTE Initial moisture		NOTE Final moisture	
The analysis performed by:		The analysis performed by:	
Signature: 		Signature: 	



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PRODUCT 2

	Trial 1	Trial 2
Drying started	Drying started	Drying started
Date : 5-08-2022	Date : 5-08-2022	Date : 5-08-2022
Time : 14:25:54	Time : 13:46:29	Time : 15:54:53
Model: AGS200	Model: AGS200	Model: AGS200
Serial number : 138	Serial number : 138	Serial number : 138
Drying parameters	Drying parameters	Drying parameters
Product : 0	Product : 0	Product : 0
Drying temperature : 105.0 °C	Drying temperature : 105.0 °C	Drying temperature : 105.0 °C
Drying profile : standard	Drying profile : standard	Drying profile : standard
Mode : Short mode	Mode : Short mode	Mode : Short mode
Calculation : $((w0-w)/w0)*100\%$	Calculation : $((w0-w)/w0)*100\%$	Calculation : $((w0-w)/w0)*100\%$
Finished : 3 samples	Finished : 3 samples	Finished : 3 samples
Initial weight : 0.604 g	Initial weight : 0.550 g	Initial weight : 1.287 g
Final weight : 0.594 g	Final weight : 0.545 g	Final weight : 1.281 g
Drying time : 00:01:40s	Drying time : 00:01:40s	Drying time : 00:01:40s
Sampling interval : 20 sec	Sampling interval : 20 sec	Sampling interval : 20 sec
Moisture : 1.7 %	Moisture : 0.9 %	Moisture : 0.5 %
NOTE Initial moisture	NOTE Final moisture	NOTE Final moisture
The analysis performed by:	The analysis performed by:	The analysis performed by:
Signature: <i>Ayali</i>	Signature: <i>Ayali</i>	Signature: <i>Ayali</i>



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Observations:

The heating behavior of Brown Sugar was investigated under the Microwave + Convection heating system. The heating rate was found to be increasing with respect to increase in time. As per physical investigation, it was observed that there was Moisture reduction after the treatment.

Concluding Remarks –

The Desired moisture was obtained successfully.

Ms. Sayali Asole
(Tested By)