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ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
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Continuous Microwave Heat Treatment for Drying of Mixed Masala Powder

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001
In Association with SVCH-Technology, Moscow (Russia)

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Customer:	**M/s. Shree Yog Krupa Industries**
Process:	**Continuous Microwave Heat Treatment for Drying of Mixed Masala Powder**

TEST REPORT No: 77/KRDC/LAB/17 Mum 09/06/2022

Date Sample reception : 08/06/2022
ID : 77/LAB/09

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 08/06/2022
Product : Mixed Masala Powder
Requirement : Final Product moisture content should be less 5%
Start Date test : 08/06/2022
Date test : 08/06/2022

LABORATORY EXPERIMENTAL SET UP FOR TRIAL:

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LAB CONTINUOUS MICROWAVE HEATING SYSTEM SPECIFICATIONS:

Microwave Power	1.45 kW(CW)
Frequency	2450 ± 50 MHz
Microwave Exposure Zone (Cavity)	1000 mm length wise
Product surface temp. range	Max. 120 deg cells
Conveyor width	380mm
Conveyor Speed	Variable 0.2 to 2MPM
Conveyor Motor Drive	0.5HP AC Induction with VFD
Entry Vestibule length	1200mm
Exit Vestibule Length	1200 mm
Exhaust Power	0.5 HP

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	$30^{o}C$ ($\pm5^{o}C$)
Humidity (%)	≤70% RH
Pressure (kN/m2 or kPa)	Not recorded

Note for recommendation: Environmental conditions have a direct impact on test results. Accuracy and consistency of test data are affected by the laboratory conditions.

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EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120IR Thermal sensitivity of 0.10°C
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: ±°C (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: ±5% RH Humidity resolution: 1% RH
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Mixed Masala Powder without adding any additive to speed up the drying rate. For this experimental run, given sample has been placed on Glass tray in MW heating system with suitable parameters. Observations are made on the final moisture content of sample, weight and appearance. Also, initial weight before drying and final weight after drying was taken.

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ANALYTICAL RESULTS:

TRIAL-1

Initial Wt.: 50g
Initial Moisture: 7.2%

Cycles	Specifications of Microwave	On product temp	Microwave exposure time	Moisture Content.	Remarks.
C1	Microwave intensity: 100%; Belt speed: 0.8 rpm	(49-56)°C	11 min	2.8%	Dried as desired

Microwave exposure time: 11min
Final Weight: 47g
Final Moisture: 2.8 %

TRIAL-2

Initial Wt.:50 g
Initial Moisture: 7.2%

Cycles	Specifications of Microwave	On product temp	Microwave exposure time (min.)	Moisture Content.	Remarks.
C1	Microwave intensity: 100%; Belt speed: 1.5 rpm	(38-41)°C	6 min	5.8%	Dried as desired

Microwave exposure time: 6min
Final Weight: 48g
Final Moisture: 5.8%

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BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

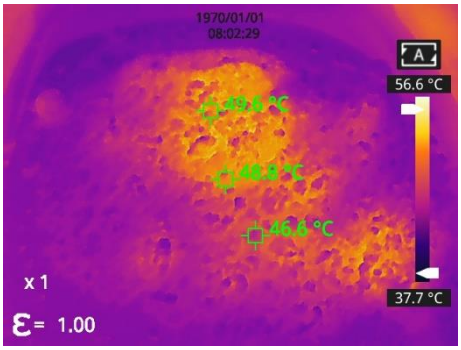
a) Untreated

b) Treated

THERMAL IMAGES:

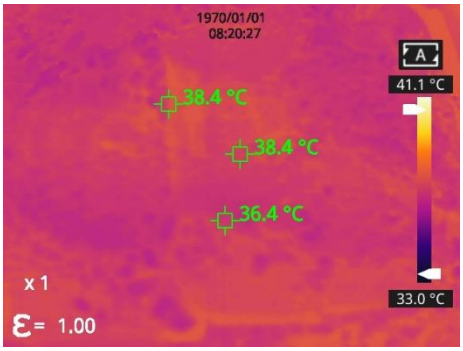
Measurements	
Sp1	49.6 °C
Sp2	48.8 °C
Sp3	46.6 °C

Parameters	
Emissivity	1.00
Temp.	56.6°C



Measurements	
Sp1	38.4 °C
Sp2	38.4 °C
Sp3	36.4 °C

Parameters	
Emissivity	1.00
Temp.	41.1 °C



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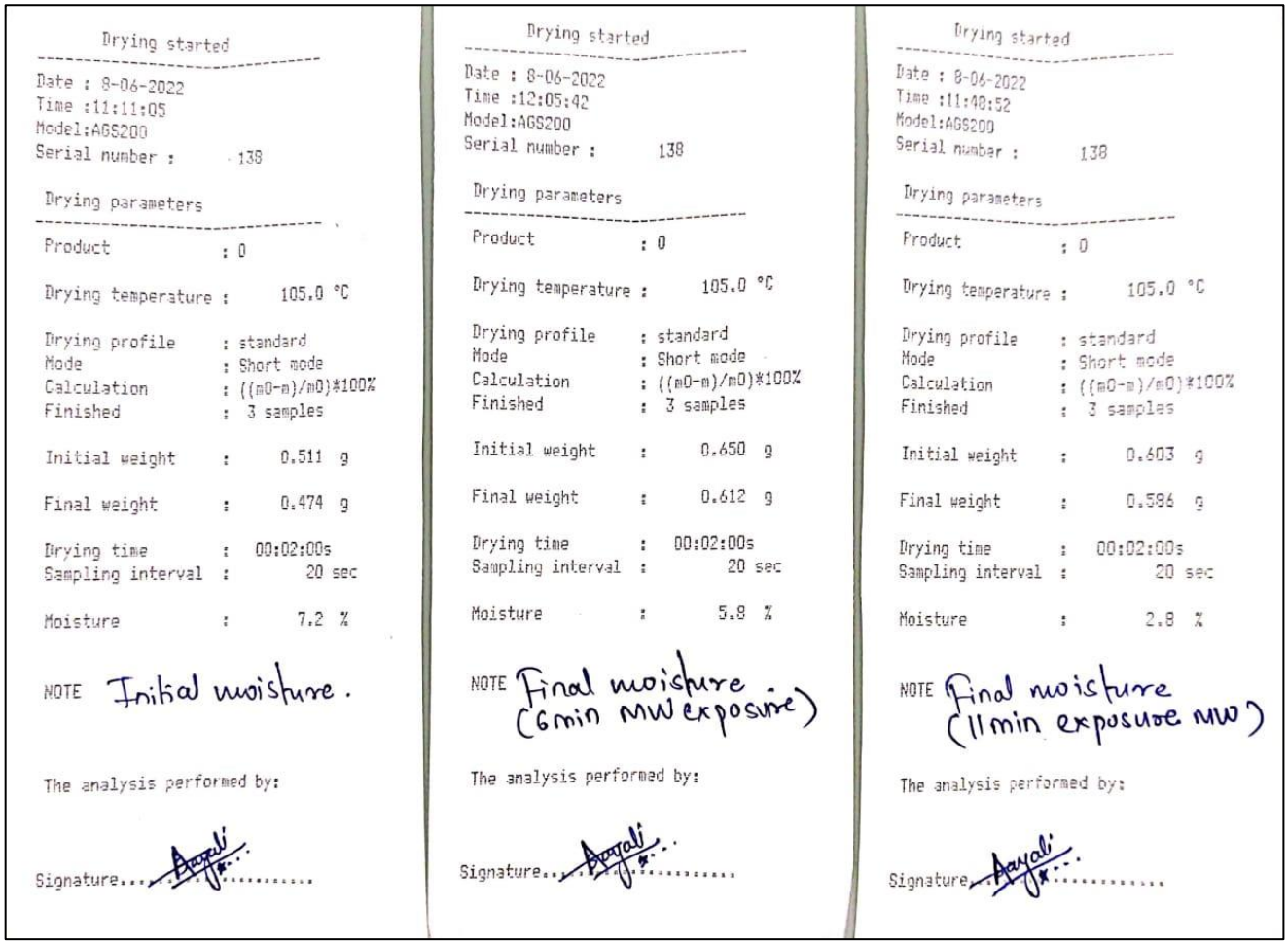
MOISTURE ANALYSIS REPORTS:



Drying started

Date : 8-06-2022
Time :11:11:05
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.511 g
Final weight : 0.474 g
Drying time : 00:02:00s
Sampling interval : 20 sec
Moisture : 7.2 %

NOTE Initial moisture.

The analysis performed by:

Signature.....

Drying started

Date : 8-06-2022
Time :12:05:42
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.650 g
Final weight : 0.612 g
Drying time : 00:02:00s
Sampling interval : 20 sec
Moisture : 5.8 %

NOTE Final moisture (6min MW exposure)

The analysis performed by:

Signature.....

Drying started

Date : 8-06-2022
Time :11:48:52
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 0.603 g
Final weight : 0.586 g
Drying time : 00:02:00s
Sampling interval : 20 sec
Moisture : 2.8 %

NOTE Final moisture (11min exposure MW)

The analysis performed by:

Signature.....

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OBSERVATION:

The drying behavior of Mixed Masala Powder has been investigated under the Continuous Microwave heating system. The drying rate is found to be increasing with respect to increase in time. As per physical investigation, it has been found that the product weight is not much affected. It has been observed that there is no degradation of product. Also the desirable moisture content as required is obtained.

Ms. Sayali Asole
(Tested By)