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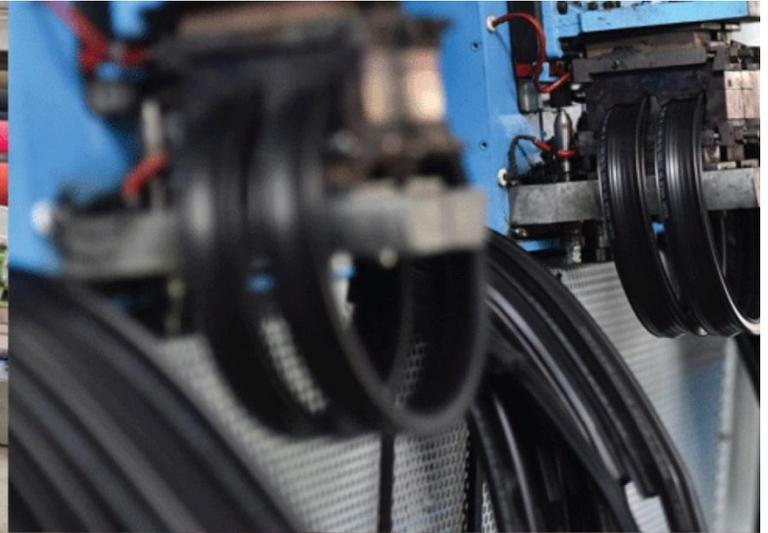
In Association With



ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC), B/47, Addl. MIDC. Anand Nagar, Ambarnath (East), Thane- 421 506,
India

Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com



**Batch Microwave+Convection Heat
Treatment for Drying of Herbs**



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Customer :	M/s Mansoon Foods
Process :	Batch Microwave+Convection Heat Treatment for Drying of Herbs

TEST REPORT No: 47/KRDC/LAB/17 Mum 15/10/2018

Date Sample reception : 15/10/2018
ID : 47/LAB/61

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 4 kg
Sampling date : 15/10/2018
Product : Herbs
Requirement : Final product must have moisture content less than 10%
Start Date test : 15/10/2018
End Date test : 15/10/2018

LABORATORY EXPERIMENTAL SET UP:



Format: F/R&D/01



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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 kW(CW)
Frequency	2450 MHz \pm 50
Convective Power	3.5 kW (air flow 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	1HP
Tray Size	450x950x50 mm

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	27.7°C (\pm 5°C)
Humidity (%)	\leq 54% 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
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)
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

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given herbs without adding any additive to speed up the drying rate. For this experimental run, the given sample of herbs has been placed on tray with uniform thickness of about 10 mm and placed in heating system with suitable setting parameters. The observations are made after every 30 minutes. Also, initial weight before drying, final weight after drying, initial moisture content, final moisture content after heat treatment has been noted.

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ANALYTICAL RESULTS:

Setting Temperature: 50°C

Microwave Power: 0.8 kW

Thickness of layer: 10 mm

Initial Moisture Content: 86.9%

Initial Weight: 459 grams

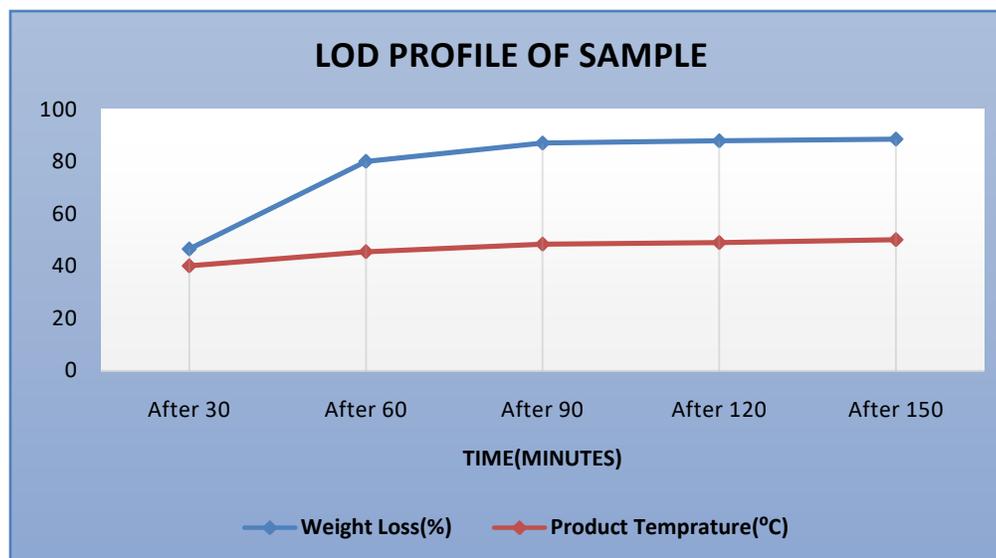
Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (%)	Temperature on sample(°C)	Remarks, if any
1.	After 30	245	46.62	40.2	Drying rate started
2.	After 60	91	80.17	45.6	Drying phase continue
3.	After 90	59	87.15	48.5	Variant of Drying rate
4.	After 120	55	88.01	49.1	Variant of Drying rate
5.	After 150	52	88.67	50.2	Required Drying rate

Sample weight after drying: 52 grams

Total weight loss on drying: 88.67%

Final Moisture Content: 9%

GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



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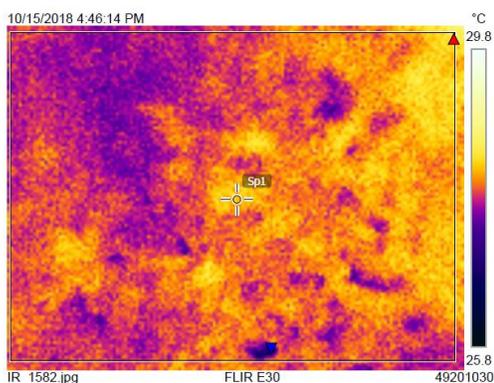
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THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

1. Before Heat Treatment:

Measurements		
Bx1	Max	28.7 °C
	Min	26.6 °C
	Average	27.9 °C
Sp1		28.2 °C

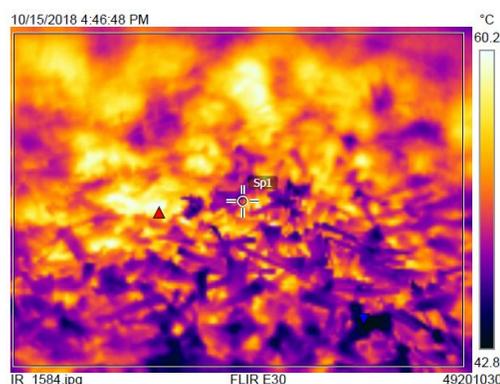
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



2. After Heat Treatment:

Measurements		
Bx1	Max	61.1 °C
	Min	40.8 °C
	Average	51.4 °C
Sp1		50.2 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C



BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



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MOISTURE ANALYSIS REPORTS:

Drying started

Date : 15-10-2018
Time : 14:44:25
Model: AGS200
Serial number : 138

Drying parameters

Product : Test

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : $\frac{(m_0 - m)}{m_0} \times 100\%$
Finished : 3 samples

Initial weight : 1.301 g
Final weight : 0.171 g

Drying time : 00:17:40s
Sampling interval : 20 sec

Moisture : 86.9 %

NOTE Initial

The analysis performed by:
Signature: *KKomal*

Drying started

Date : 15-10-2018
Time : 17:29:54
Model: AGS200
Serial number : 138

Drying parameters

Product : Test

Drying temperature : 105.0 °C

Drying profile : standard
Mode : Short mode
Calculation : $\frac{(m_0 - m)}{m_0} \times 100\%$
Finished : 3 samples

Initial weight : 0.342 g
Final weight : 0.311 g

Drying time : 00:02:00s
Sampling interval : 20 sec

Moisture : 9 %

NOTE final

The analysis performed by:
Signature: *KKomal*

OBSRVATIONS:

The Drying behavior of herbs has been investigated under the microwave+convection heating system. The drying rate is found to be increasing with respect to increasing drying time. It has been found that the moisture content on the dry basis (%) decreases with respect to increase drying time. As per physical investigation, it has been observed that there is crunchiness in texture without burning and there is no colour change.

KKomal

Miss Komal Bhoite
Tested By

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