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Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane - 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com

Batch Microwave+Convection Heat Treatment for Drying of Pistachios

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

MEMBER OF A.M.P.E.R.E (EUROPE)
MEMBER OF AIMCAL (USA)

IN ASSOCIATION WITH EMitech, ITALY

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Customer :	**M/s. Food Studio**
Process :	**Batch Microwave+Convection Heat Treatment for Drying of Pistachios**

TEST REPORT No: 47/KRDC/LAB/17 Mum 24/07/2020

Date Sample reception : 08/07/2020
ID : 47/LAB/168

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 4.5 kg
Sampling date : 24/07/2020
Product : Pistachio
Requirement : Drying
Start Date test : 24/07/2020
End Date test : 24/07/2020

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 kW(CW)
Frequency	2450 MHz ± 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)	30°C (±5°C)
Humidity (%)	≤75% 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 given sample of pistachios to speed up the heating rate for drying treatment. For this experimental run, given sample has been placed in batch microwave hybrid heating system for different setting parameters to achieve required drying rate. The observations are made on the basis of temperature on product, total weight loss and any damage to product samples.

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ANALYTICAL RESULTS:

1. **Trial No. 1:**

Microwave Power: 1.2 kW
Hot Air Temperature: 130°C
Initial Moisture Content: 13.3%
Initial Weight: 500 gm

Sr. No.	Cycle Time (minutes)	Final Wt. (gm)	Total Wt. Loss (gm)	Surface Temp. (°C)	Remarks
1.	After 20	432	68	90-95	Drying rate started
2.	After 30	408	24	110-115	Dried

Final Weight: 408 gm
Total Wt. Loss: 92gm.
Final Moisture Content: 1%.

2. **Trial No. 2:**

Microwave Power: 1.8 kW
Hot Air Temperature: 150°C
Initial Moisture Content: 13.3%
Initial Weight: 3.5 kg

Sr. No.	Cycle Time (min)	Final Wt. (gm)	Total Wt. Loss (gm)	Surface Temp. (°C)	Remarks
1.	After 30	3065	435	80-85	Drying rate started
2.	After 45	2852	213	90-95	Dried

Final Weight: 2.852 kg
Total Wt. Loss: 648gm.
Final Moisture Content: 1.2%.

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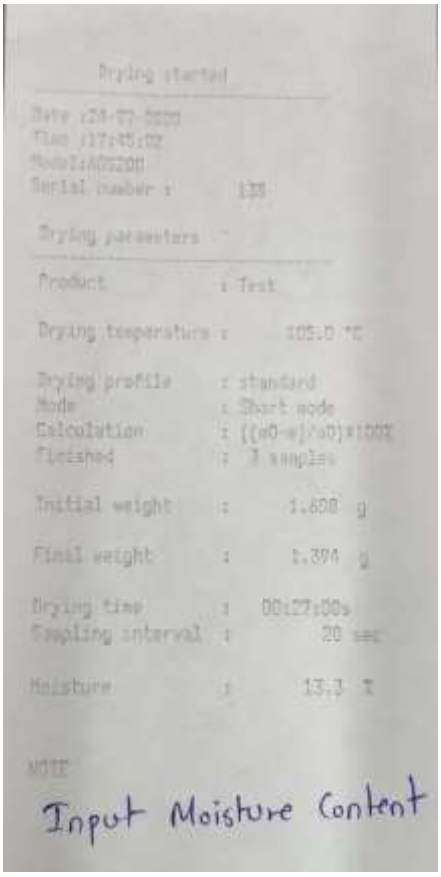
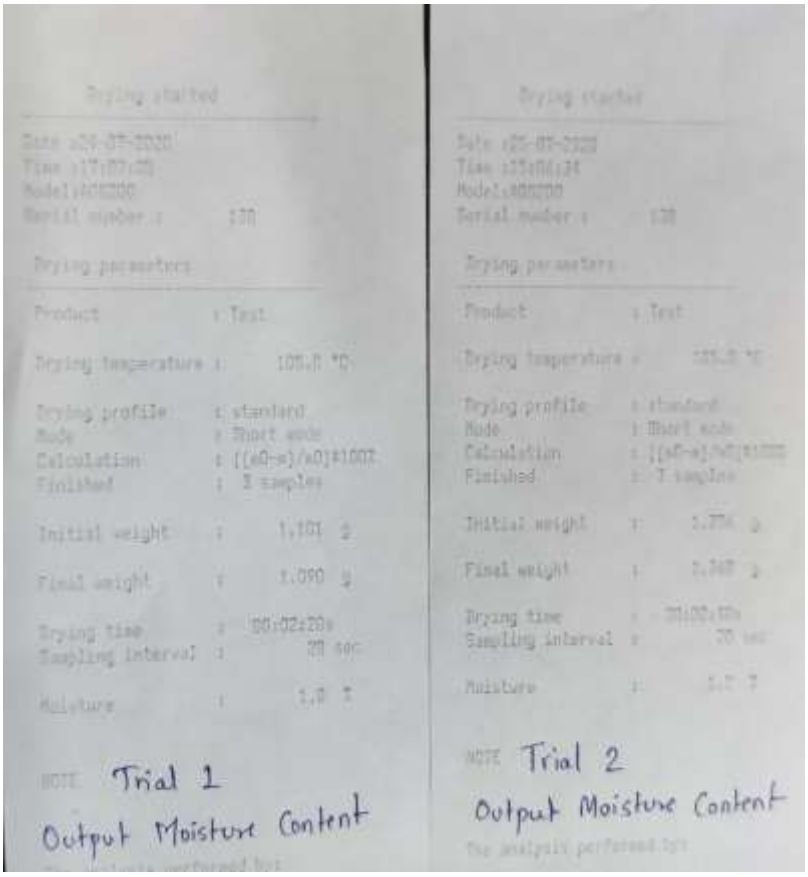
MOISTURE ANALYSIS REPORTS:

Input Moisture Content:



Output Moisture Content:



BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

1. **Trial No. 1**

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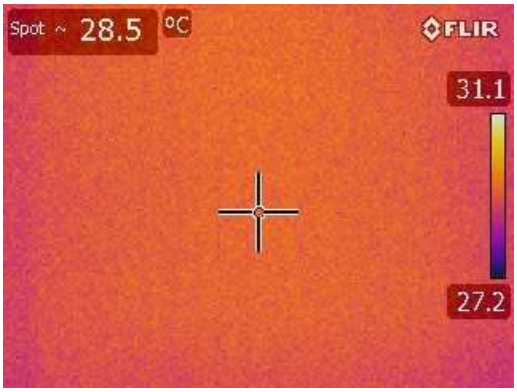
2. **Trial No. 2**

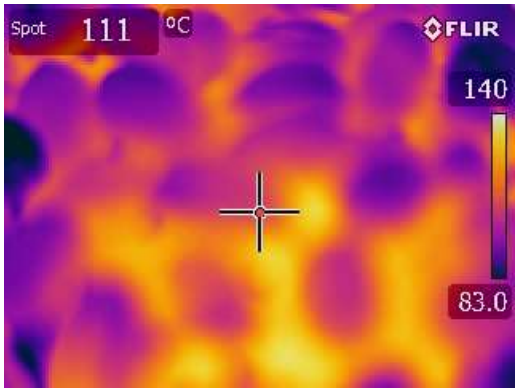
THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

1. **Trial 1**

Before Heat Treatment:



After Heat Treatment:



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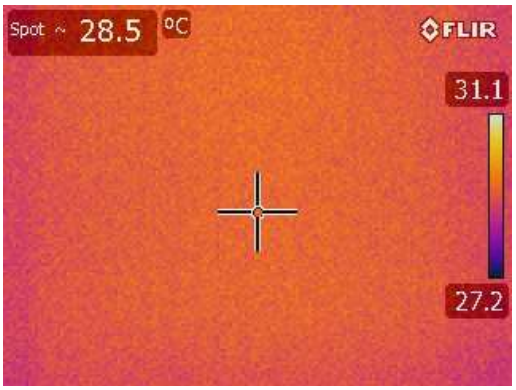
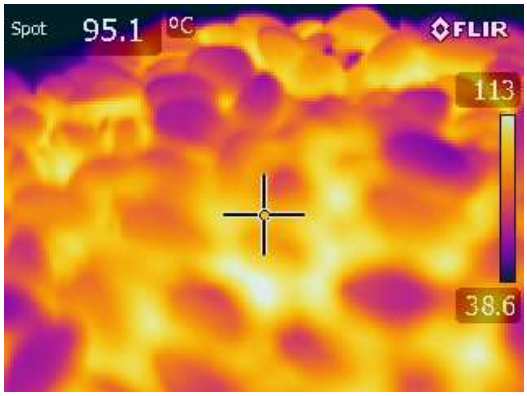
2. Trial 2

Before Heat Treatment:



After Heat Treatment:



OBSRVATIONS:

The drying behavior of pistachios has been investigated under the Microwave+Covection 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. In the processed sample, as per physical investigation, it has been observed that there is no colour change on sample with required temperature on product.

K Komal

Miss. Komal Bhoite
Tested By