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Batch Microwave+Convection Heat Treatment for Drying of Soaked Wheat Grains

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

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Customer :	**M/s. Heena Enterprise**
Process :	**Batch Microwave+Convectiom Heat Treatment for Drying of Soaked Wheat Grains**

TEST REPORT No: 47/KRDC/LAB/17 Mum 14/03/2020

Date Sample reception : 14/03/2020
ID : 47/LAB/166

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 6 kg
Sampling date : 14/03/2020
Product : Soaked Wheat Grains
Requirement : Final product must have moisture content less than 5%
Start Date test : 14/03/2020
End Date test : 14/03/2020

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^{o}C)
Microwave Exposure Zone (cavity)	1 cubic meter
Mode Stirrer	One
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250^{o}C
Exhaust Power	1HP
Tray Size	450x950x50 mm

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	35^{o}C (±5^{o}C)
Humidity (%)	≤40% 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 120 IR 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 overnight soaked wheat grains to speed up the drying rate. For this experimental run, given sample has placed on microwave transparent tray with layer of about 15-20 mm thickness and heating treatment has been given in Microwave+Convection heating system with suitable parameters. Observations are made on LOD basis. Also, initial and final moisture content of sample has been taken.

ANALYTICAL RESULTS:

1. **Trial No. 1:**
   Microwave Power: 1.5kW
   Setting Temperature: 70°C

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Initial Weight: 2.5 kg

Initial Moisture Content: 32.48%

Sr. No.	Time (minutes)	Temperature on sample (°C)	Moisture Content (%)	Remarks, if any
1.	After 15	80	28	Drying rate started
2.	After 30	90	22	Drying phase continue
3.	After 60	110	10	Variant of Drying rate
4.	After 75	110	2	Required Drying Rate with Burning effect

Final Weight: 1.5 kg
Total Weight Loss: 40%
Final Moisture Content: 2.5%

2. **Trial No. 2:**

Microwave Power: Initially 1.5kW; after 30 minutes 1.8kW

Setting Temperature: 80°C

Initial Weight: 2.5 kg

Initial Moisture Content: 32.48%

Sr. No.	Time (minutes)	Temperature on sample (°C)	Moisture Content (%)	Remarks, if any
1.	After 10	80	30	Drying rate started
2.	After 20	85	22	Drying phase continue
3.	After 30	95	17	Variant of Drying rate
4.	After 40	100	10	Variant of Drying rate
5.	After 50	110	6	Variant of Drying rate
6.	After 60	110	4	Required Drying rate

Final Weight: 1.6 kg
Total Weight Loss: 36%
Final Moisture Content: 3.9%

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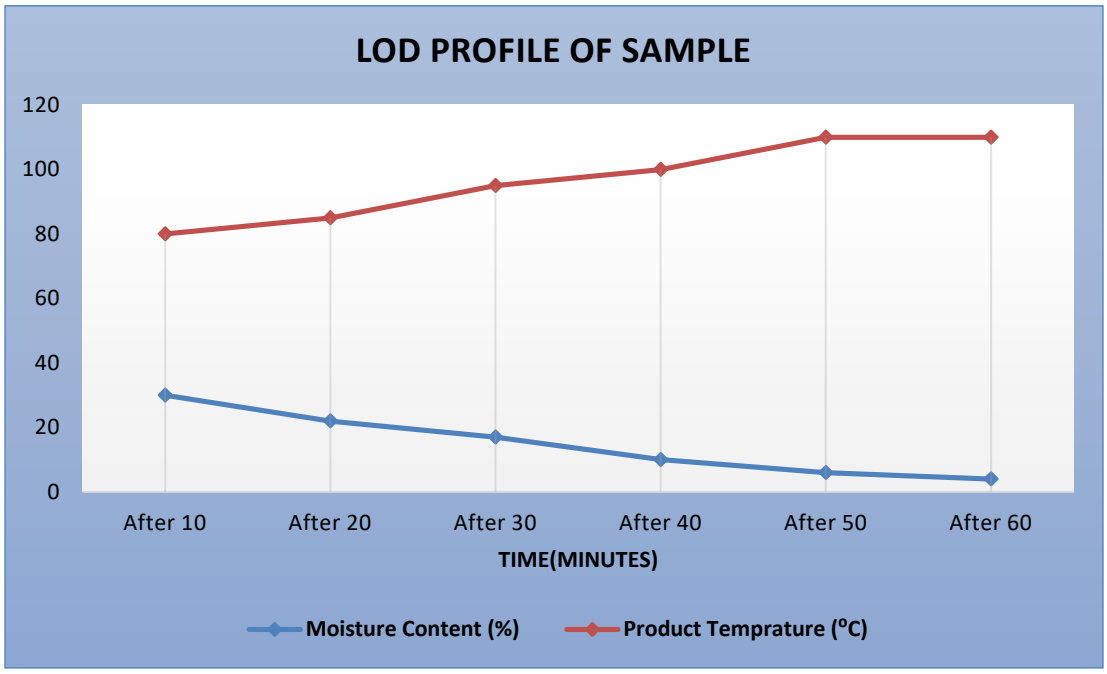
GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:

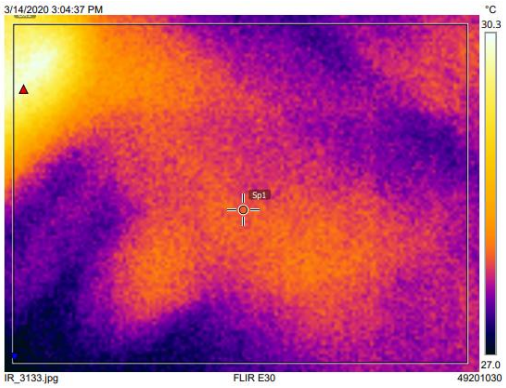


THERMAL IMAGE BEFORE AND AFTER HEAT TRAETMENT:

1. **Before Heat Treatment:**

Measurements		
Bx1	Max	30.5 °C
	Min	26.8 °C
	Average	28.6 °C
Sp1		28.3 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C



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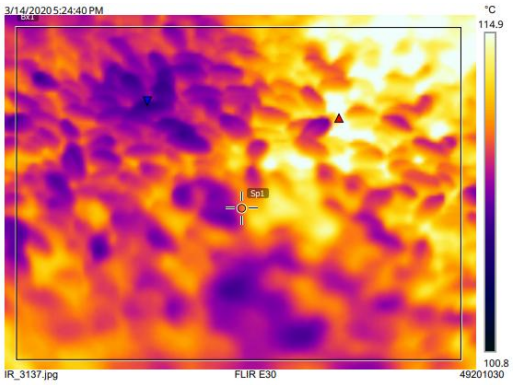
2. After Heat Treatment:

Measurements		
Bx1	Max	110.2 °C
	Min	102.2 °C
	Average	106.2 °C
Sp1		109.4 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C



BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

OBSRVATIONS:

The drying behavior of Soaked Wheat Grains has been investigated under the Microwave+convection heating system. The drying rate is found to be increasing with respect to increasing time. It has been found that the moisture content on the dry basis (%) decreases with respect to increase in drying time. As per physical investigation, it has been observed that there is little colour change and no damage to material with required final moisture content and required texture.

K Komal

Miss. Komal Bhoite
Tested By