



# KERONE

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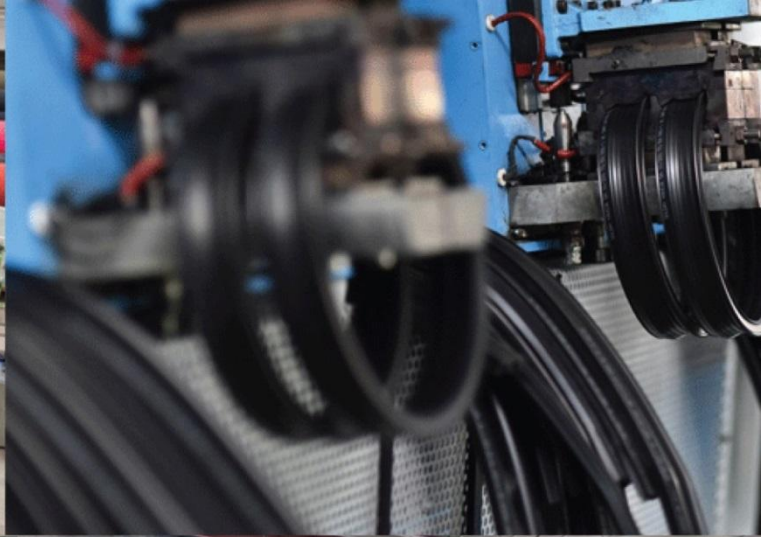
A.M.P.E.R.E (EUROPE)

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- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com



**Batch Microwave+Convection Heat  
Treatment for Drying of Coconut Husk**

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



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Customer :	M/s. Kohinoor Organic Farm Company
Process :	Batch Microwave+Convection Heat Treatment for Drying of Coconut Husk

**TEST REPORT No: 47/KRDC/LAB/17 Mum 09/07/2019**

Date Sample reception : 09/07/2019

ID : 47/LAB/121

**SAMPLE DESCRIPTION:**

Sampling : As Requested

Sample Condition : Acceptable

Quantity : 1 bag

Sampling date : 30/07/2019

Product : Coconut husk

Requirement : Final product must have moisture content around 18%

Start Date test : 30/07/2019

End Date test : 30/07/2019

**LABORATORY EXPERIMENTAL SET UP:**



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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°C ( $\pm$ 5°C)
Humidity (%)	$\leq$ 89% RH
Pressure (kN/m <sup>2</sup> 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





## 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: $\pm^{\circ}\text{C}$ (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH

## SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on coconut husk with adding water to speed up the drying rate. For this experimental run, 1500 grams of given sample has been taken and 1200 ml of water has been added to increase the moisture content upto 50%. Then this sample has been taken in tray with uniform thickness of 60 mm and heating treatment has been given. Observations are made after every 10 minutes by using moisture analysis test. Also, Initial weight and final weight has been taken.



## ANALYTICAL RESULTS:

Microwave Power: 1 kW for initial 30 minutes, then 1.5kW

Setting Temperature: 60°C

Initial Moisture Content: 10.6%

Initial weight: 1500 grams

Moisture Content after adding water: 48.8%

Weight after adding water: 2543 grams

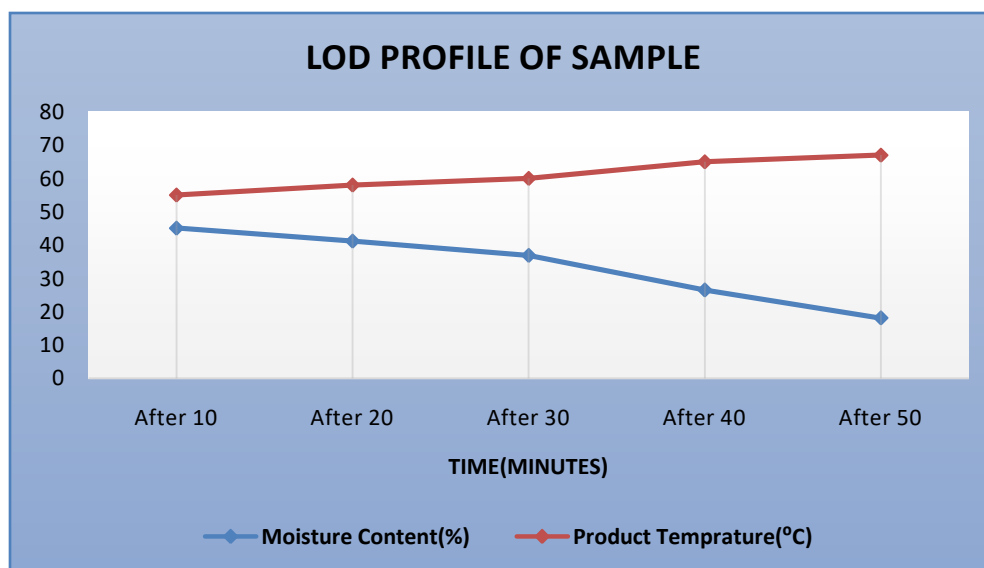
Sr. No.	Time (minutes)	Moisture content (%)	Temperature on sample(°C)	Remarks, if any
1.	After 10	45.1	55	Drying rate started
2.	After 20	41.2	58	Drying Phase continue
3.	After 30	36.9	60	Variant of drying rate
4.	After 40	26.5	65	Variant of drying rate
5.	After 50	18.1	67	Required Drying rate

Sample weight after drying: 1795 grams

Total Moisture loss on drying: 30.7%

Final Moisture Content: 18.1%

## GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



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## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

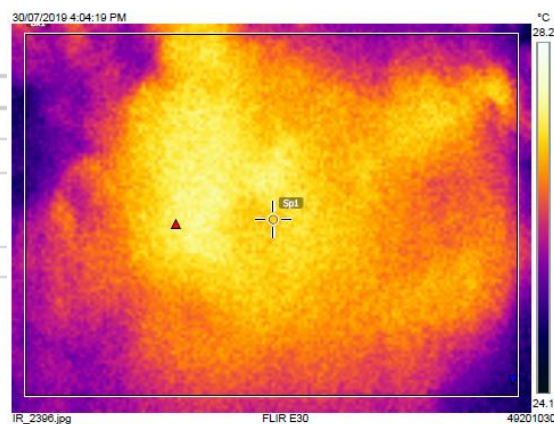
### 1. Before Heat Treatment:

#### Measurements

Bx1	Max	27.7 °C
	Min	24.8 °C
	Average	26.5 °C
Sp1		27.0 °C

#### Parameters

Emissivity	0.95
Refl. temp.	20 °C



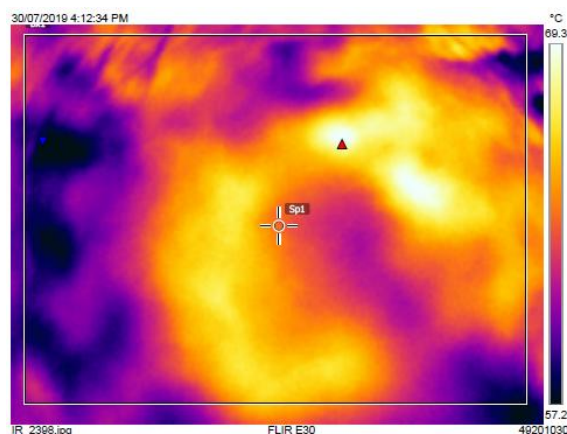
### 2. After Heat Treatment:

#### Measurements

Bx1	Max	69.6 °C
	Min	56.7 °C
	Average	63.0 °C
Sp1		63.6 °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 :30-07-2019	Time :15:29:38
Model:AGS200	Serial number : 138
Drying parameters	
Product : Test	
Drying temperature : 105.0 °C	
Drying profile : standard	
Mode : Short mode	
Calculation : $((w_0 - w)/w_0) \times 100\%$	
Finished : 3 samples	
Initial weight : 0.745 g	
Final weight : 0.666 g	
Drying time : 00:03:00s	
Sampling interval : 20 sec	
Moisture : 10.6 %	
NOTE Initial	
The analysis performed by:	
Signature: <u>K Komal</u>	

Drying started	
Date :30-07-2019	Time :16:09:04
Model:AGS200	Serial number : 138
Drying parameters	
Product : Test	
Drying temperature : 105.0 °C	
Drying profile : standard	
Mode : Short mode	
Calculation : $((w_0 - w)/w_0) \times 100\%$	
Finished : 3 samples	
Initial weight : 0.946 g	
Final weight : 0.484 g	
Drying time : 00:07:20s	
Sampling interval : 20 sec	
Moisture : 48.8 %	
NOTE After adding water	
The analysis performed by:	
Signature: <u>K Komal</u>	

Drying started	
Date :30-07-2019	Time :17:25:34
Model:AGS200	Serial number : 138
Drying parameters	
Product : Test	
Drying temperature : 105.0 °C	
Drying profile : standard	
Mode : Short mode	
Calculation : $((w_0 - w)/w_0) \times 100\%$	
Finished : 3 samples	
Initial weight : 0.630 g	
Final weight : 0.516 g	
Drying time : 00:02:00s	
Sampling interval : 20 sec	
Moisture : 18.1 %	
NOTE Final	
The analysis performed by:	
Signature: <u>K Komal</u>	

## OBSRVATIONS:

The Drying behavior of Coconut husk has been investigated under 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. As per physical investigation, it has been observed that there is no colour change and no burning effect with desired moisture content.

K Komal

Miss. Komal Bhoite  
Tested By

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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.