



A CRISIL-NSIC RATED COMPANY  
ISO-9001-2008 COMPANY

Member Of



AIMCAL(USA)



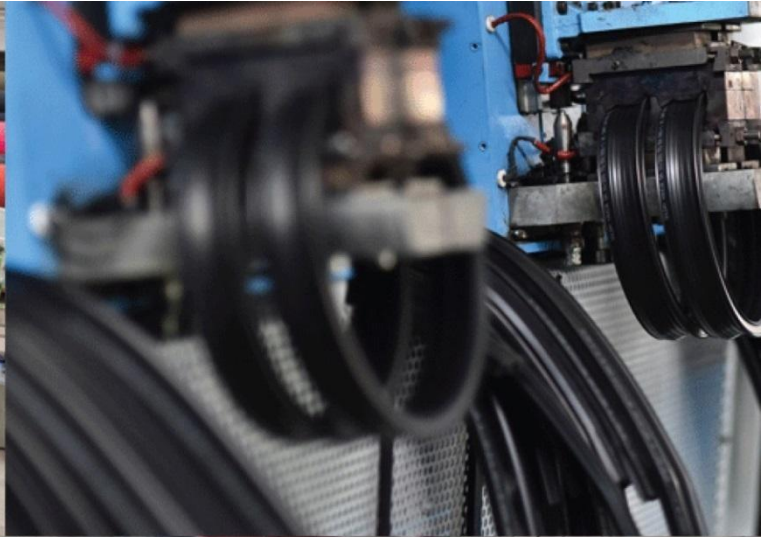
A.M.P.E.R.E(EUROPE)

In Association With



ELECTRO MAGNETIC innovative technologies

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



**Batch Convection Heat Treatment on  
Cooked Basmati Rice**



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



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

Customer :	M/s. Rishikesh Exports
Process :	Batch Convection Heat Treatment on Cooked Basmati Rice

**TEST REPORT No: 47/KRDC/LAB/17 Mum 12/07/2021**

Date Sample reception : 12/07/2021

ID : 47/LAB/01

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
 Sample Condition : Acceptable  
 Quantity : 1 Kg  
 Samples opening date : 12/07/2021  
 Product : Basmati Rice (Heritage)  
 StartDatetest : 12/07/2021  
 EndDatetest : 12/07/2021

**LABORATORY EXPERIMENTAL SETUP:****Format: F/R&D/01**





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

#### LAB BATCH CONVECTION HEATING SYSTEM SPECIFICATIONS:

Heating Zone (width*height*depth)	510*480*410 mm
No. of Heaters	6
Total Heater Power	6 kW
Motor	0.5 HP
No. of trays	6
Tray size (width*height*depth)	560 x 435 x25
Centrifugal Exhaust Blower	1440 rpm

#### ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (°C)	26°C (±5°C)
Humidity (%)	≤74% 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



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

## 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: $\pm 0.1^{\circ}\text{C}$ ( $1.8^{\circ}\text{F}$ ) Temperature resolution: $0.1^{\circ}\text{C}$ ( $0.2^{\circ}\text{F}$ ) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\% \text{RH}$ Humidity resolution: 1%RH
Vertical Autoclave		Working Size: 12" dia x 12" ht Rating: 3.0K.W. Pressure Range: upto 2 kg/cm <sup>2</sup>

Format: F/R&D/01



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

### **SAMPLE PREPARATION AND METHOD/PROCEDURE:**

The experiment has been performed on Basmati Rice (Heritage) to speed up the drying rate. For this experimental run, after washing under tap water, rice has been partly cooked by steaming in vertical autoclave upto the pressure of 1 kg/cm<sup>2</sup> for 15-20 minutes. Then, this partly cooked rice is placed on a dehydrator tray in such a manner that it forms a uniform layer in order to allow the hot air to circulate evenly to achieve the drying characteristics and then it is kept in batch convection heating system for treatment. The observations are made after every 15 minutes. Also, initial weight before drying, weight after washing, weight after steaming, final weight after drying, initial moisture content, moisture content after washing, moisture content after steaming, final moisture content after treatment, and moisture content after cooking test, i.e., rehydration has been taken.

### **ANALYTICAL RESULTS:**

**Initial Wt. of rice- 250g**

**Initial moisture of untreated rice-3.7%**

**Weight of rice after washing-249 g**

**Moisture of washed rice- 14.2%**

**Weight of rice after steaming-576 g**

**Initial moisture of rice- 56.2%**

**Setting Temperature: 70°C**

**Total time: 1 Hr 30mins.**

**Cycle Time: 15mins each**



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

Sr. No	Cycle Time (mins.)	Weight of rice(grams)	Weight loss of rice(%)	Product Temp. ( °C)	Moisture Content (%)	Remarks, if any
1	After 15 mins	534	7.29	43°C	50.3%	Drying starts
2	After 30 mins	482	9.73	43.2°C	45.2%	Surface of layer is dried
3	After 45 mins	389	19.29	43.8°C	36.6%	Drying continues
4	After 1hr	309	20.56	43.7°C	28.5%	Drying continues
5	After 1hr 15 mins	254	17.8	48°C	11.82%	Almost dried
6	After 1hr 30 mins	230	9.44	49.1°C	7.0%	Drying completes

#### AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

Untreated Rice



Steamed Rice



Format: F/R&D/01



ELECTRO MAGNETIC innovative technologies



A CRISIL-NSIC RATED  
COMPANY ISO-9001-2008

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

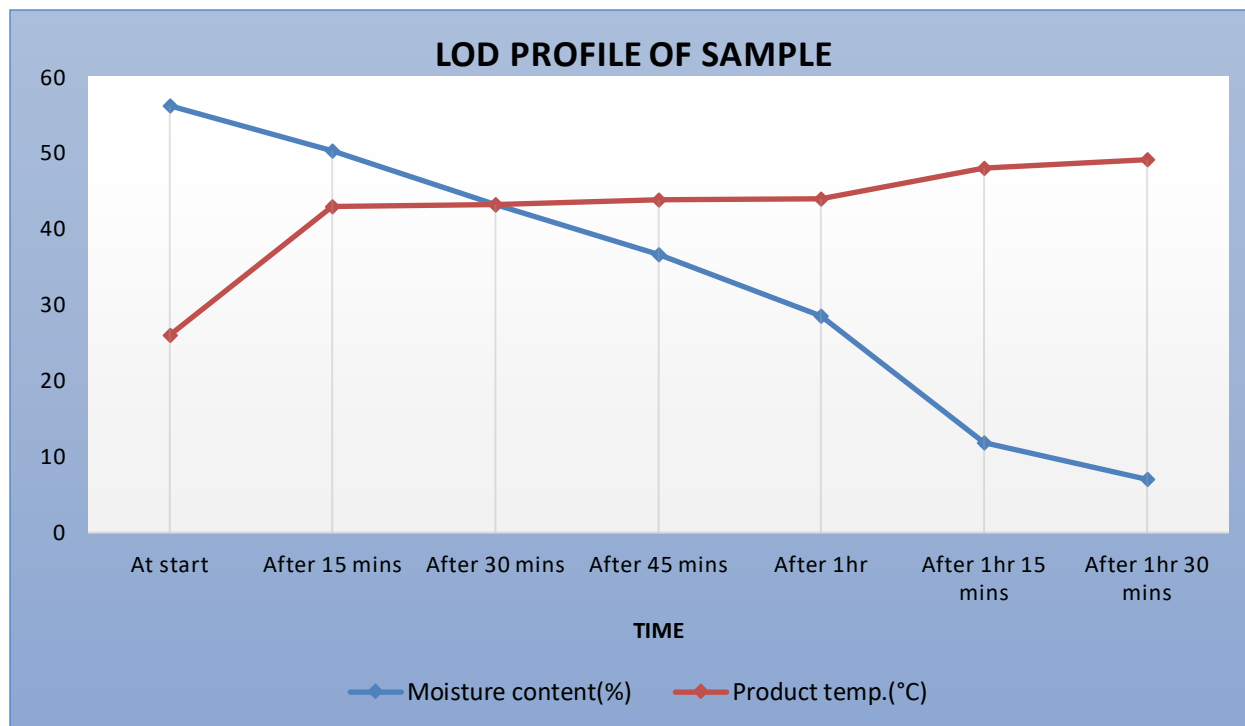
Dehydrated Rice



Rehydrated Rice



#### GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



Format: F/R&D/01



ELECTRO MAGNETIC innovative technologies

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

## THERMAL ANALYSIS REPORTS :

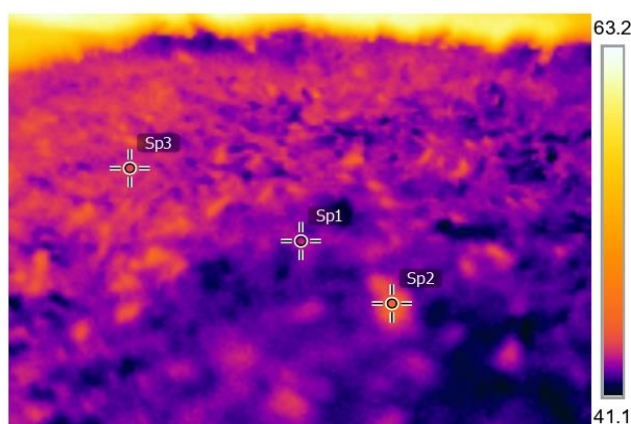
### AFTER 3<sup>RD</sup> CYCLE:

#### Measurements

Sp1	43.8 °C
Sp2	46.4 °C
Sp3	44.9 °C

#### Parameters

Emissivity	0.95
Refl. temp.	20 °C



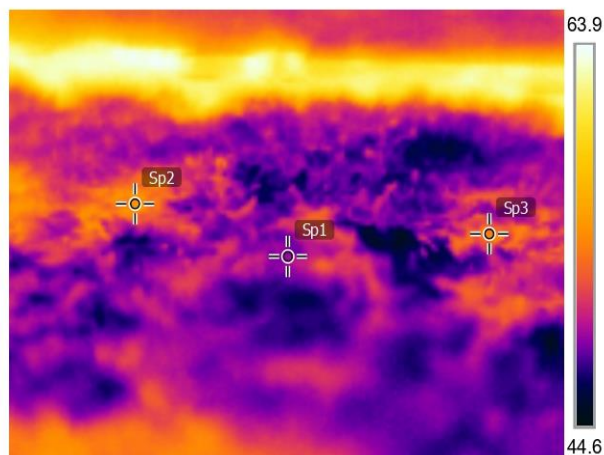
### AFTER 6<sup>TH</sup> CYCLE:

#### Measurements

Sp1	49.4 °C
Sp2	55.0 °C
Sp3	54.0 °C

#### Parameters

Emissivity	0.95
Refl. temp.	20 °C



Format: F/R&D/01





ELECTRO MAGNETIC innovative technologies



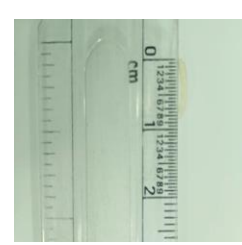
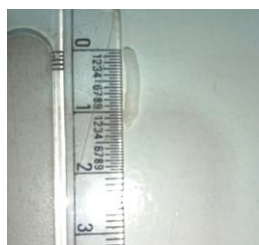
A CRISIL-NSIC RATED  
COMPANY ISO-9001-2008

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

## MOISTURE ANALYSIS REPORTS:

<p>Drying started</p> <p>Date :12-07-2021 Time :11:08:14 Model:AGS200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : <math>((w0-w)/w0)*100</math> Finished : 3 samples</p> <p>Initial weight : 1.362 g Final weight : 1.311 g</p> <p>Drying time : 00:07:20s Sampling interval : 20 sec</p> <p>Moisture : 3.7 %</p> <p>NOTE Initial moisture of Untreated Rice</p> <p>The analysis performed by: 0</p> <p>Signature: <i>Komal</i></p>	<p>Drying started</p> <p>Date :12-07-2021 Time :12:17:55 Model:AGS200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : <math>((w0-w)/w0)*100</math> Finished : 3 samples</p> <p>Initial weight : 1.189 g Final weight : 1.070 g</p> <p>Drying time : 00:09:00s Sampling interval : 20 sec</p> <p>Moisture : 14.2 %</p> <p>NOTE Moisture after Washing of Rice</p> <p>The analysis performed by: 0</p> <p>Signature: <i>Komal</i></p>	<p>Drying started</p> <p>Date :12-07-2021 Time :13:08:41 Model:AGS200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : <math>((w0-w)/w0)*100</math> Finished : 3 samples</p> <p>Initial weight : 1.447 g Final weight : 0.634 g</p> <p>Drying time : 00:22:00s Sampling interval : 20 sec</p> <p>Moisture : 54.2 %</p> <p>NOTE Moisture of Boiled Rice</p> <p>The analysis performed by: 0</p> <p>Signature: <i>Komal</i></p>	<p>Drying started</p> <p>Date :12-07-2021 Time :15:27:15 Model:AGS200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : <math>((w0-w)/w0)*100</math> Finished : 3 samples</p> <p>Initial weight : 2.043 g Final weight : 1.901 g</p> <p>Drying time : 00:16:21s Sampling interval : 20 sec</p> <p>Moisture : 7.0 %</p> <p>NOTE Final moisture of Rice after dewatering in Horizontal Batch Convection Heater</p> <p>The analysis performed by: 0 (Rathayda)</p> <p>Signature: <i>Komal</i></p>	<p>Drying started</p> <p>Date :12-07-2021 Time :17:33:40 Model:AGS200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : 0</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short mode Calculation : <math>((w0-w)/w0)*100</math> Finished : time over</p> <p>Initial weight : 2.042 g Final weight : 0.922 g</p> <p>Drying time : 00:19:00s Sampling interval : 20 sec</p> <p>Moisture : 55.3 %</p> <p>NOTE Moisture of Rice after Rehydration test (Horizontal Convection Heater)</p> <p>The analysis performed by: 0</p> <p>Signature: <i>Komal</i></p>
--	---	--	--	---

## PICTURES OF GRAIN SIZE AFTER EVERY TREATMENT:



Format: F/R&D/01



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

### COOKING TEST/ REHYDRATION TEST:

For this test, 70g of treated sample has been taken in a beaker and then boiled water (around 200ml) is added to it and covered for 5 mins followed by stirring. Also, weight and moisture content of rehydrated rice is noted.



Moisture Content of Rehydrated rice: 55.3%

### OBSERVATIONS:

The Drying behavior of steamed rice has been investigated under the 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 little colour change to yellowish.

Ms. Komal Ingle  
Tested By