



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

Member Of



AIMCAL (USA)



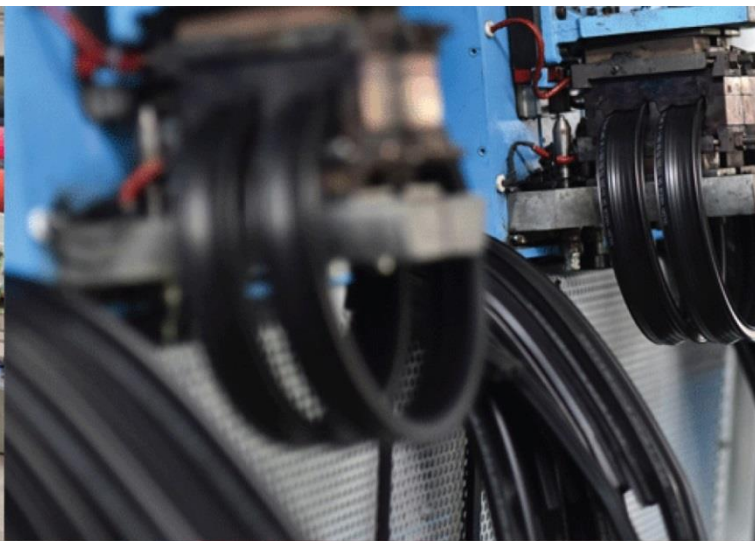
A.M.P.E.R.E (EUROPE)

In Association With



ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC, Anand Nagar, 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 Wheat & Water
Slurry**

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. Dhaval Distil Evap Private Limited
Process :	Batch Microwave+Convection Heat Treatment for Drying of Wheat & Water Slurry

TEST REPORT No: 47/KRDC/LAB/17 Mum 01/12/2018

Date Sample reception : 01/12/2018
ID : 47/LAB/67

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 1 kg
Sampling date : 08/12/2018
Product : Wheat flour
Requirement : Final product must have moisture content less than 5%
Start Date test : 08/12/2018
End Date test : 08/12/2018

LABORATORY EXPERIMENTAL SET UP:



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 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)	28.1°C (\pm 5°C)
Humidity (%)	\leq 63% RH
Pressure (kN/m ² 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 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: $\pm 1^{\circ}\text{C}$ (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 wheat flour with adding water to speed up the drying rate. For this experimental run, 150 grams of wheat flour has been taken and then 0.5 liter of water has been added to make a slurry. This slurry on microwave transparent tray with uniform thickness of about 5 mm has been placed in heating system with suitable setting parameters. The observations are made after every 30 minutes. Also, moisture content and temperature on product has been noted for each time interval.

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

ANALYTICAL RESULTS:

Initial Weight of Slurry: 624 grams

Initial Moisture Content Of slurry: 68.9%

Sr. No.	MW Power(kW)	Setting Temp(°C)	Time (minutes)	Weight Loss (%)	Remarks, if any
1.	1	90	After 30	19.57	Drying rate started
2.	1	90	After 60	51.92	Drying phase continue
3.	0.7	70	After 90	70.99	Variant of Drying rate
4.	0.7	70	After 120	76.6	Required Drying rate

Final Moisture Content: 2.6%

THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

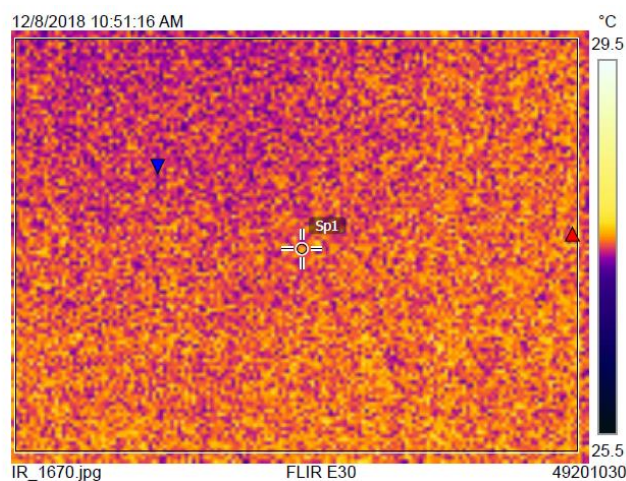
1. Before Heat Treatment:

Measurements

Bx1	Max	28.0 °C
	Min	27.1 °C
	Average	27.5 °C
Sp1		27.7 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C



Format: F/R&D/01



ELECTRO MAGNETIC Innovative technologies



KERONE

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

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

2. After Heat Treatment:

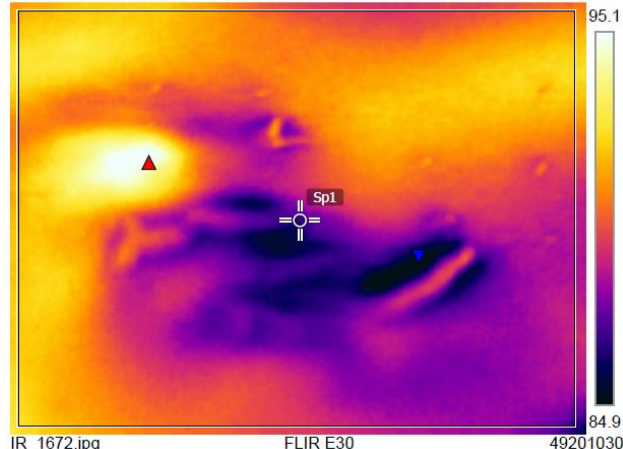
Measurements

Bx1	Max	95.4 °C
	Min	84.4 °C
	Average	89.7 °C
Sp1		86.5 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C

12/8/2018 11:33:03 AM



MOISTURE ANALYSIS REPORTS:

Drying started		Drying started	
Date : 8-12-2018	Date : 8-12-2018	Date : 8-12-2018	Date : 8-12-2018
Time : 11:58:35	Time : 13:51:53	Time : 13:51:53	Time : 13:51:53
Model: AGS200	Model: AGS200	Model: AGS200	Model: AGS200
Serial number : 138	Serial number : 138	Serial number : 138	Serial number : 138
Drying parameters		Drying parameters	
Product : Test	Product : Test	Product : Test	Product : Test
Drying temperature : 105.0 °C	Drying temperature : 105.0 °C	Drying temperature : 105.0 °C	Drying temperature : 105.0 °C
Drying profile : standard	Drying profile : standard	Drying profile : standard	Drying profile : standard
Mode : Short mode	Mode : Short mode	Mode : Short mode	Mode : Short mode
Calculation : $((m0-m)/m0)*100\%$	Calculation : $((m0-m)/m0)*100\%$	Calculation : $((m0-m)/m0)*100\%$	Calculation : $((m0-m)/m0)*100\%$
Finished : 3 samples	Finished : 3 samples	Finished : 3 samples	Finished : 3 samples
Initial weight : 1.325 g	Initial weight : 1.271 g	Initial weight : 1.271 g	Initial weight : 1.271 g
Final weight : 0.412 g	Final weight : 1.238 g	Final weight : 1.238 g	Final weight : 1.238 g
Drying time : 01:01:20 sec	Drying time : 00:04:20s	Drying time : 00:04:20s	Drying time : 00:04:20s
Sampling interval : 20 sec	Sampling interval : 20 sec	Sampling interval : 20 sec	Sampling interval : 20 sec
Moisture : 68.9 %	Moisture : 2.6 %	Moisture : 2.6 %	Moisture : 2.6 %
NOTE Initial	NOTE Final	NOTE Final	NOTE Final
The analysis performed by: KKomal	The analysis performed by:	The analysis performed by:	The analysis performed by:
	Signature: KKomal	Signature: KKomal	Signature: KKomal

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

BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



OBSERVATIONS:

The Drying behavior of wheat flour and water slurry 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 complete drying with crunchiness in texture and there is colour change without burning.

K Komal

Miss Komal Bhoite
Tested By