



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

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AIMCAL (USA)



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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 Sugar Jaggery  
Powder**

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



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<b>Customer :</b>	<b>M/s. EID Parry India Limited</b>
<b>Process :</b>	<b>Batch Microwave+Convection Heat Treatment for Drying of Sugar Jaggery Powder</b>

**TEST REPORT No: 47/KRDC/LAB/17 Mum 18/02/2021**

Date Sample reception : 18/02/2021

ID : 47/LAB/188

**SAMPLE DESCRIPTION:**

Sampling : As Requested

Sample Condition : Acceptable

Quantity : 3 kg

Sampling date : 19/02/2021

Product : Sugar Jaggery Powder

Requirement : Final moisture content should be less than 1%

Start Date test : 19/02/2021

End Date test : 19/02/2021

**LABORATORY EXPERIMENTAL SET UP:****Format: F/R&D/01**

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**LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:**

<b>Microwave Power</b>	2 kW(CW)
<b>Frequency</b>	2450 MHz $\pm$ 50
<b>Convective Power</b>	3.5 kW (air flow 350 l/min at 20°C)
<b>Microwave Exposure Zone (cavity)</b>	1 cubic meter
<b>Mode Stirrer</b>	One
<b>Thermal Monitoring System</b>	Single Channel Fiber Optic: Range -40 to 250°C
<b>Exhaust Power</b>	1HP
<b>Tray Size</b>	450x950x50 mm

**ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:**

<b>Temperature (degree C)</b>	34°C ( $\pm$ 5°C)
<b>Humidity (%)</b>	$\leq$ 45% RH
<b>Pressure (kN/m<sup>2</sup> or kPa)</b>	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: $\pm^{\circ}\text{C}$ (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 sample of sugar jaggery powder to speed up the drying rate for drying treatment. For this experimental run, given sample has been placed in microwave transparent tray with layer of about 10-15 mm and microwave exposure has been given with different parameters. The observations are made on the basis of the temperature on product, weight loss and moisture content of the product.

**Format: F/R&D/01**





SOLUZIONI E SERVIZI DI ANALISI E CONTROLLO



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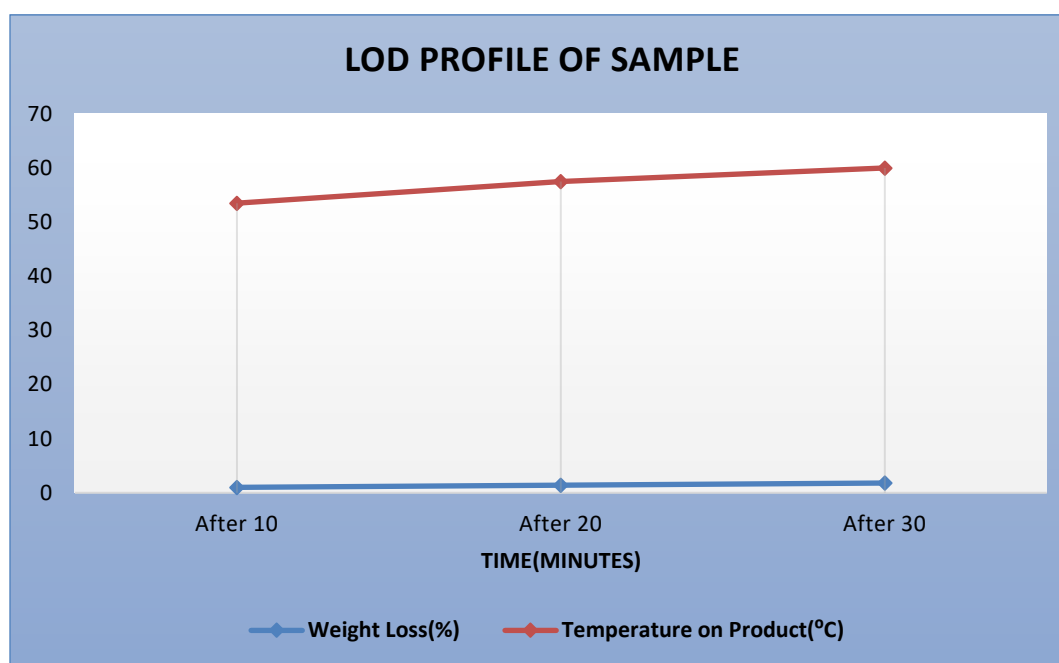
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**ANALYTICAL RESULTS:****Microwave Power: 0.7 kW****Setting Temperature: 70°C****Initial Weight: 500 grams****Initial Moisture Content: 1.92%**

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (%)	Temperature on sample(°C)	Remarks, if any
1.	After 10	495	1	52-55	Drying rate started
2.	After 20	493	1.4	55-60	Drying phase continue
3.	After 30	491	1.8	58-62	Required Drying rate

**Final Weight: 491 grams****Total Weight loss: 1.8%****Final Moisture Content: 0.78%****GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:****Format: F/R&D/01**

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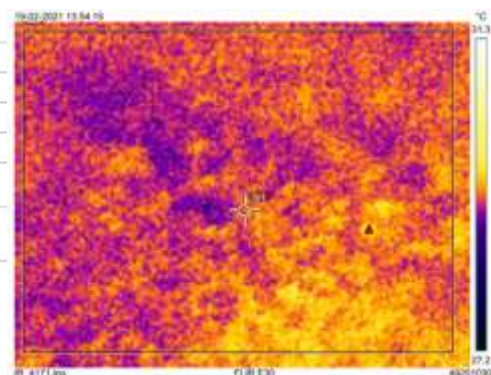
RECTORIO S. KASHIMIRO Associate Senior Engineer

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## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

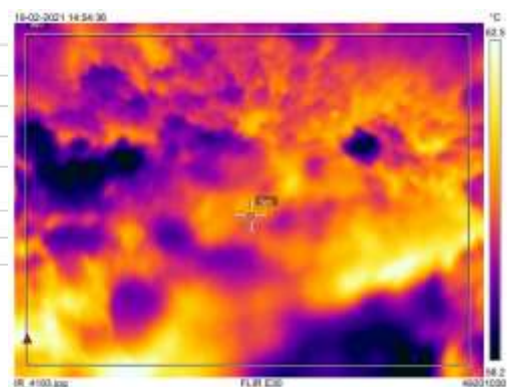
### 1. Before Heat Treatment:

Measurements		
Bx1	Max	29.8 °C
	Min	28.7 °C
	Average	29.2 °C
Sp1		29.3 °C
Parameters		
Emissivity		0.95
Ref. temp.		20 °C



### 2. After Heat Treatment:

Measurements		
Bx1	Max	61.7 °C
	Min	59.7 °C
	Average	60.7 °C
Sp1		58.9 °C
Parameters		
Emissivity		0.95
Ref. temp.		20 °C



## BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:



BEFORE



AFTER

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MEMBER OF AIMCAL (USA)

IN ASSOCIATION WITH EMitech, ITALY



RESEARCH & DEVELOPMENT Associates Pvt. Ltd.



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### **OBSERVATIONS:**

The Drying behavior of sugar jaggery powder has been investigated under the microwave+convection irradiation mode dryer for drying treatment. 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 in drying time. As per physical investigation, it has been observed that required moisture has been achieved without burning and color change.

**Miss. Komal Bhoite**

**Tested By**

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