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ISO-9001-2008 COMPANY

Member Of



AIMCAL (USA)



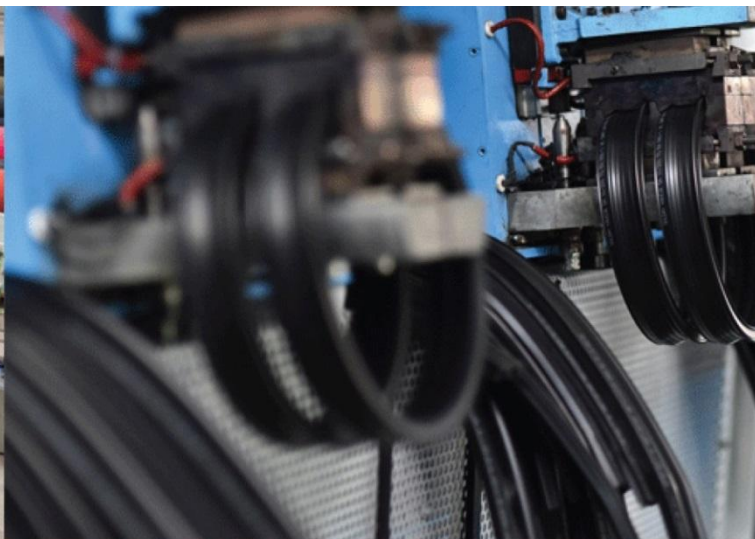
A.M.P.E.R.E (EUROPE)

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 Granular material**

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



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Customer :	M/s. Grasim, Aditya Birla
Process :	Batch Microwave+Convection Heat Treatment for Drying of Granular material

TEST REPORT No: 47/KRDC/LAB/17 Mum 16/10/2019

Date Sample reception : 16/10/2019
ID : 47/LAB/139

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 10 kg
Sampling date : 05/11/2019
Product : Granular material
Requirement : Drying with 30-40% final moisture content
Start Date test : 05/11/2019
End Date test : 05/11/2019

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)	34°C (\pm 5°C)
Humidity (%)	\leq 61% 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.



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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 given sample of Granular Material to speed up the drying rate. For this experimental run, given sample has been soaked in water for 2 hours in ratio 1:10(Granular material: Water) to increase the moisture content upto 75% and then placed in microwave transparent tray microwave tray for drying and microwave exposure has been given with different setting parameters. The observations are made on the basis of temperature on product and final moisture content.

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ANALYTICAL RESULTS:

Initial Moisture Content of sample: 8%

Initial Weight of sample taken: 200 grams

Water taken for soaking: 2000 ml

Soaking Time: 2 hours

Moisture content after soaking: 75.6%

Weight after soaking: 740 grams

Soaked Sample taken for each trial: 185 grams

Sr. No.	MW Power (kW)	Setting Temp (°C)	Time (minutes)	Temp. on product (°C)	Final Weight (grams)	Final Moisture Content (%)	Remarks, if any
1.	0.8	70	45	55-65	75	33.8	No change
2.	1	70	30	55-65	85	39.3	No change
3.	1.2	70	30	55-65	78	37.2	No change
4.	1.5	70	25	65-75	76	35.4	No change

THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

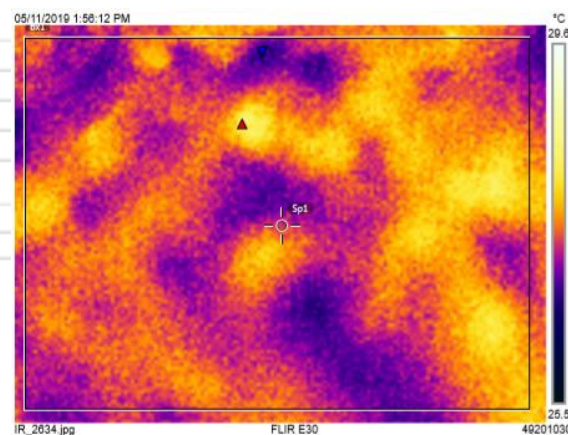
1. Before Heat Treatment:

Measurements

Bx1	Max	28.6 °C
	Min	26.5 °C
	Average	27.4 °C
Sp1		27.3 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C





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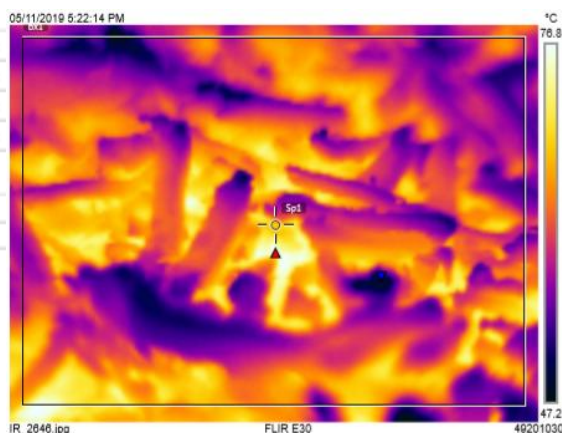
2. After Heat Treatment:

Measurements

Bx1	Max	77.2 °C
	Min	48.0 °C
	Average	62.3 °C
Sp1		69.0 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C



MOISTURE ANALYSIS REPORTS:

<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : 3 samples</p> <p>Initial weight : 0.933 g Final weight : 0.879 g</p> <p>Drying time : 00:04:20s Sampling interval : 20 sec</p> <p>Moisture : 5.0 %</p> <p>NOTE Initial</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>	<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : 3 samples</p> <p>Initial weight : 2.673 g Final weight : 2.651 g</p> <p>Drying time : 00:22:00s Sampling interval : 20 sec</p> <p>Moisture : 75.6 %</p> <p>NOTE After Soaking in water for 2hrs</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>	<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : 3 samples</p> <p>Initial weight : 0.715 g Final weight : 0.473 g</p> <p>Drying time : 00:06:40s Sampling interval : 20 sec</p> <p>Moisture : 33.0 %</p> <p>NOTE Final (Trial No.1)</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>	<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : 3 samples</p> <p>Initial weight : 0.733 g Final weight : 0.445 g</p> <p>Drying time : 00:08:40s Sampling interval : 20 sec</p> <p>Moisture : 39.3 %</p> <p>NOTE Final (Trial No.2)</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>	<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : 3 samples</p> <p>Initial weight : 0.761 g Final weight : 0.445 g</p> <p>Drying time : 00:08:00s Sampling interval : 20 sec</p> <p>Moisture : 37.2 %</p> <p>NOTE Final (Trial No.3)</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>	<p>Drying started</p> <p>Date : 5-11-2019 Time : 11:40:40 Model: A05200 Serial number : 138</p> <p>Drying parameters</p> <p>Product : Test</p> <p>Drying temperature : 105.0 °C</p> <p>Drying profile : standard Mode : Short soak Calculation : [(w0-w)/w0]*100 Finished : time over</p> <p>Initial weight : 0.840 g Final weight : 0.544 g</p> <p>Drying time : 00:05:05s Sampling interval : 20 sec</p> <p>Moisture : 35.4 %</p> <p>NOTE Final (Trial No.4)</p> <p>The analysis performed by: Signature: <i>KKomal</i></p>
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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.



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BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



OBSERVATIONS:

The drying behavior of Granular Material has been investigated under the Microwave+Convection irradiation mode dryer. As per physical investigation, it has been observed that there is no colour change in sample with required moisture content.

A handwritten signature in black ink, reading "K Komal".

Miss. Komal Bhoite
Tested By