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ELECTRO MAGNETIC Innovative Technologies

Kerone Research & Development Centre (KRDC),
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CONTINUOUS ROTARY IR HEAT TREATMENT FOR DRYING OF MONOLITHIC REFRACTORY 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. CALDERYS INDIA REFRACTORIES LIMITED**
Process :	**Continuous Rotary IR heat treatment for drying of Monolithic Refractory Material**

TEST REPORT No: 67/KRDC/LAB/17 Mum 29/04/2022

Date Sample reception : 25/04/2022
ID : 67/LAB/29

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 29/04/2022
Product : Monolithic Refractory Material
Requirement : Nil the moisture content in the given sample
Start test Date : 29/04/2022
End test Date : 29/04/2022

LABORATORY EXPERIMENTAL SETUP: LAB ROTARY IR HEATING SYSTEM

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LAB ROTARY IR HEATING SYSTEM SPECIFICATIONS:

Infrared Power	5 kW
Type of Infrared Emitters	Quartz Infrared
Rotary Drum Size	Φ324 mm x 800 mm long x 3mm Thk.
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250°C
Exhaust	Exhaust port with manual damper
Air Circulation Fan	Radial Fan FHP 0.5HP

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	30°C (±5°C)
Humidity (%)	≤67% RH
Pressure (kN/m2 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 120IR Thermal sensitivity of 0.10°C
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: ±°C (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: ±5% RH Humidity resolution: 1% RH
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)

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SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given sample i.e. monolithic refractory material for drying treatment. For this experimental run, sample were passed through the rotary drum and treated in Continuous IR heating system. The observations are made on the basis of moisture content and physical changes in product samples.

Method use to increase moisture content- The initial moisture content in the given sample was 0.0%. To increase the moisture content by 11% for the experimental run the amount of water used was 60ml for 480g of sample. Also after adding the water the sample weight was increased.

(480g sample + 60 ml water) = moisture increase by 11% approx. with total weight 540g

Before and after photo of sample-

a) Initial sample

b) after increasing moisture content

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ANALYTICAL RESULTS:

Trial No. 1:

Initial Weight: 540g
Initial Moisture: 11.1%
Setting temperature: 250°C
Drum speed: 0.15 rpm

Sr. No.	Cycle Time (minutes)	Product Temp. (°C)	Moisture Content. %	Remarks.
1.	After 6 min. 36 sec.	(110-133) °C	0.0	Dried as desired.

Final weight: 466g
Final Moisture: 0.0%
Total cycle time: 6 min 36 sec.

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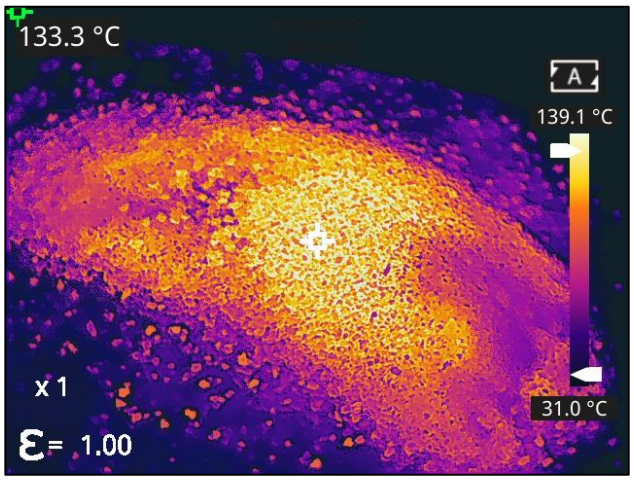
BEFORE AND AFTER PICTURES OF TREATED SAMPLE:

a) Untreated

b) Treated

THERMAL IMAGE HEAT TREATMENT



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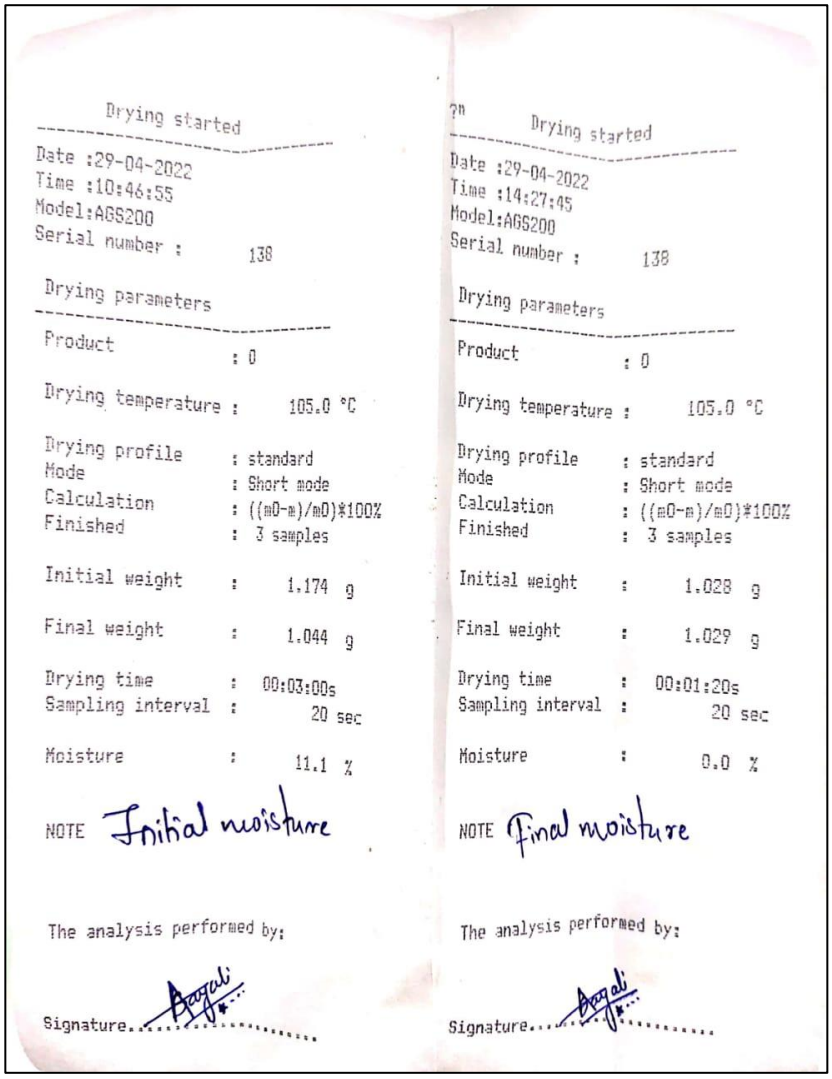
MOISTURE ANALYSIS REPORTS:



Drying started

Date :29-04-2022
Time :10:46:55
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 1.174 g
Final weight : 1.044 g
Drying time : 00:03:00s
Sampling interval : 20 sec
Moisture : 11.1 %

NOTE Initial moisture

The analysis performed by:

Signature.....

?n Drying started

Date :29-04-2022
Time :14:27:45
Model:AGS200
Serial number : 138

Drying parameters

Product : 0
Drying temperature : 105.0 °C
Drying profile : standard
Mode : Short mode
Calculation : ((m0-m)/m0)*100%
Finished : 3 samples
Initial weight : 1.028 g
Final weight : 1.029 g
Drying time : 00:01:20s
Sampling interval : 20 sec
Moisture : 0.0 %

NOTE Final moisture

The analysis performed by:

Signature.....

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OBSERVATIONS:

The heating behavior of Monolithic Refractory Material has been investigated under the Continuous IR Heating System. The heating rate is found to be increasing with respect to increasing cycle time. As per the physical investigation, the sample was having crystal and powder material. Due to toppling effect on material in rotary drum the sample was uniformly dried in minimum cycle time. The material after treatment is in acceptable condition. The requirement of nil the moisture content in the sample material has been successfully achieved.

Ms. Sayali Asole

Tested By