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Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
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Batch Microwave+Convection Heat Treatment for Drying of Silica Slurry Cake

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

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Customer :	**Mr. Sacre-Davey Engineering**
Process :	**Batch Microwave+Convection Heat Treatment for Drying of Silica Slurry Cake**

TEST REPORT No: 47/KRDC/LAB/17 Mum 23/12/2019

Date Sample reception : 23/12/2019
ID : 47/LAB/152

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 10 kg
Sampling date : 06/01/2020
Product : Silica Slurry Cake
Requirement : Final product must have moisture content less than 10%
Start Date test : 06/01/2020
End Date test : 06/01/2020

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

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

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	34^{o}C (±5^{o}C)
Humidity (%)	≤48% 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
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: ±°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

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Silica slurry cake without adding any additive to speed up the drying rate. For this experimental run, given sample has been placed in microwave transparent tray with 15 mm thickness of layer for drying with suitable setting parameters. Also, initial moisture content before drying, final moisture content after drying has been taken.

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ANALYTICAL RESULTS:

Initial Moisture Content: 72.8%

1. **Trial No. 1:**
   Microwave Power: 1 kW
   Setting Temperature: 55°C
   Initial Weight: 1000 grams

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (%)	Temperature on sample(°C)	Remarks, if any
1.	After 20	856	14.4	60-70	Drying rate started
2.	After 40	642	35.8	60-70	Drying phase continue
3.	After 60	462	53.8	70-80	Variant of Drying rate
4.	After 80	312	68.8	70-80	Variant of Drying rate
5.	After 100	276	72.4	70-80	Required Drying Rate

Sample weight after drying: 276 grams
Total weight loss on drying: 72.4%
Final Moisture Content: 3.9%

2. **Trial No. 2:**
   Microwave Power: 1.5 kW
   Setting Temperature: 55°C
   Initial Weight: 1000 grams

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (%)	Temperature on sample(°C)	Remarks, if any
1.	After 15	805	19.5	70-80	Drying rate started
2.	After 30	552	44.8	70-80	Drying phase continue
3.	After 45	344	65.6	80-90	Variant of Drying rate

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4.	After 60	273	72.7	80-90	Required Drying Rate

Sample weight after drying: 273 grams
Total weight loss on drying: 72.7%
Final Moisture Content: 3.7%

3. **Trial No. 3:**
   Microwave Power: 2 kW
   Setting Temperature: 55°C
   Initial Weight: 1000 grams

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (%)	Temperature on sample(°C)	Remarks, if any
1.	After 10	836	16.4	70-80	Drying rate started
2.	After 20	636	36.4	80-90	Drying phase continue
3.	After 30	444	55.6	80-90	Variant of Drying rate
4.	After 40	294	70.6	80-90	Required Drying Rate

Sample weight after drying: 294 grams
Total weight loss on drying: 70.6%
Final Moisture Content: 5.6%

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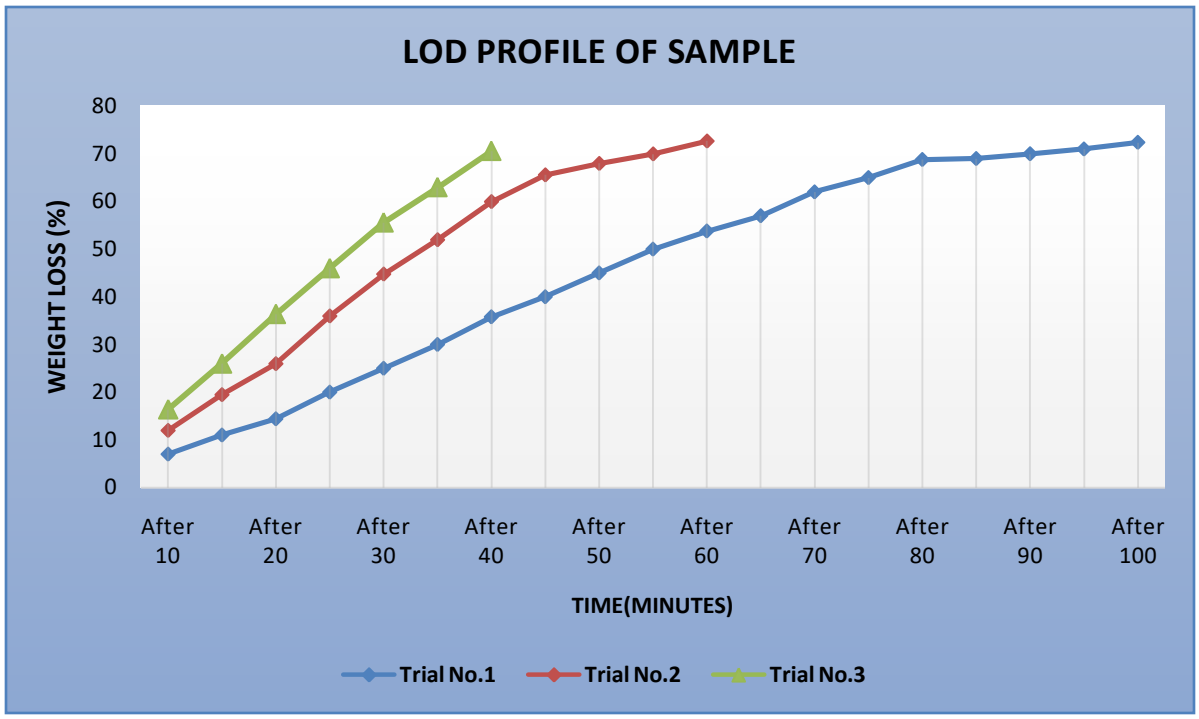
GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:

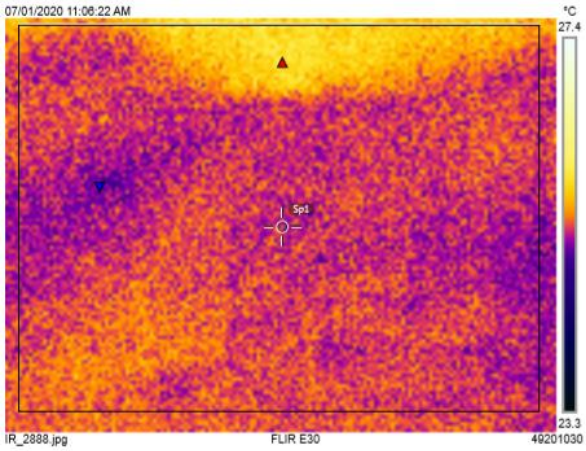


THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

1. Before Heat Treatment:

Measurements		
Bx1	Max	26.1 °C
	Min	24.9 °C
	Average	25.4 °C
Sp1		25.5 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C



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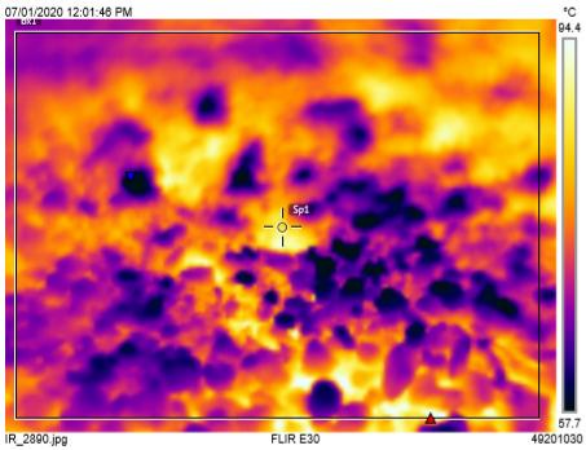
2. After Heat Treatment:

Measurements		
Bx1	Max	101.4 °C
	Min	54.0 °C
	Average	73.5 °C
Sp1		85.5 °C
Parameters		
Emissivity		0.95
Refl. temp.		20 °C



BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

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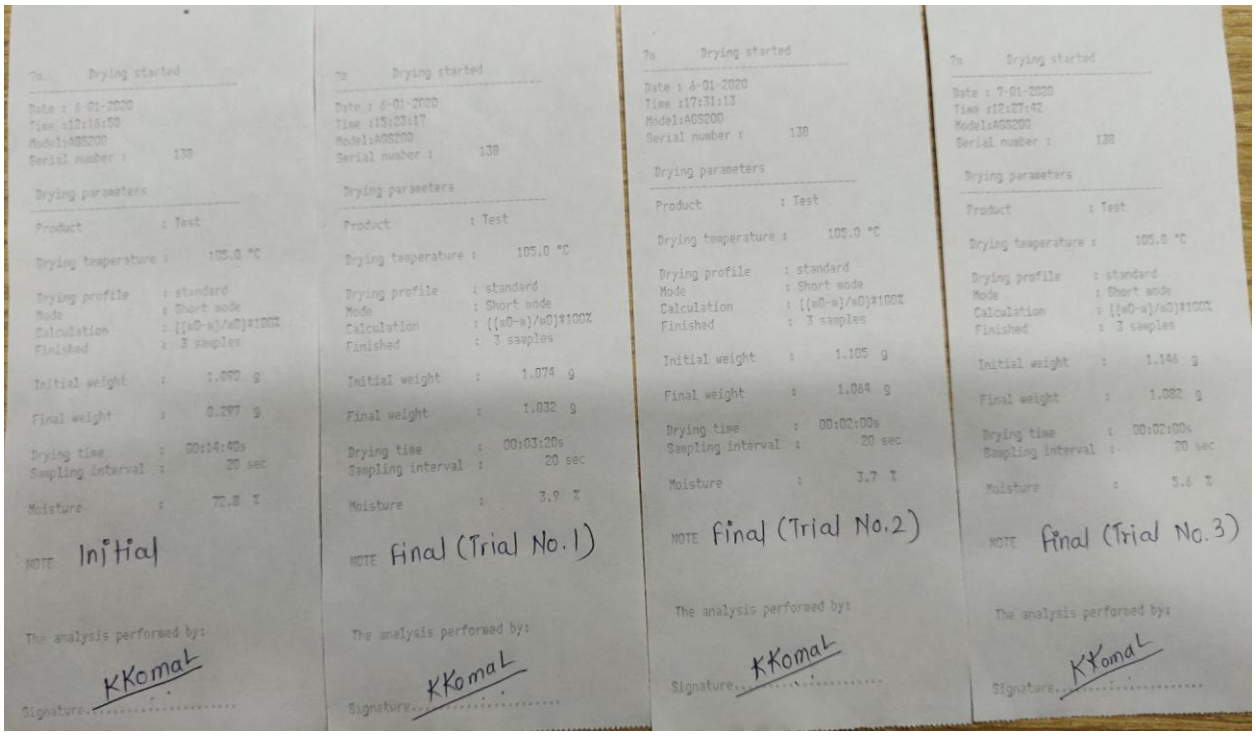
MOISTURE ANALYSIS REPORTS:



OBSRVATIONS:

The Drying behavior of Silica slurry cake has been investigated under the Microwave+Covection 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 no colour change in sample with required final moisture content.

KKomal

Miss Komal Bhoite
Tested By