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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 Bentonite Granules

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

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IN ASSOCIATION WITH EMitech, ITALY

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Customer :	**M/s. Swell Well Minechem Pvt. Ltd.**
Process :	**Batch Microwave+Convection Heat Treatment for Drying of Bentonite Granules**

TEST REPORT No: 47/KRDC/LAB/17 Mum 25/06/2020

Date Sample reception : 20/06/2020
ID : 47/LAB/164

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 12 Nos.
Sampling date : 25/06/2020
Product : Bentonite Granules
Requirement : Final product must have moisture content less than 1%
Start Date test : 25/06/2020
End Date test : 25/06/2020

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	3 kW(CW)
Frequency	2450 MHz ± 50
Convective Power	1.5 kW (air flow 350 l/min at 20^{o}C)
Microwave Exposure Zone (Cavity)	650 mm x 650 mm x 400 mm
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250^{o}C
Exhaust Power	1HP
Turntable Size	Ø 550 mm

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	32^{o}C (±5^{o}C)
Humidity (%)	≤80% 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 Bentonite Granules to speed up the drying rate. For this experimental run, given sample has been placed in microwave transparent tray with 20 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:

1. **Trial No. 1:**
   Sample No: SWMPL/LR/1468/2020
   Microwave Power: 1.6 kW
   Setting Temperature: 80°C
   Initial Weight: 1104 grams
   Initial Moisture Content: 12.6%

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (grams)	Temperature on sample(°C)	Remarks, if any
1.	After 10	1019	85	104-110	Drying Rate Started
2.	After 15	981	38	130-135	Drying Phase Continues
3.	After 20	967	14	150	Variant of Drying Rate
4.	After 25	964	3	150	Required Drying Rate

Sample weight after drying: 964 grams
Total weight loss on drying: 140 grams
Final Moisture Content: 0.3%

2. **Trial No. 2:**
   Sample No: SWMPL/LR/1469/2020
   Microwave Power: 1.6 kW
   Setting Temperature: 80°C
   Initial Weight: 1133 grams
   Initial Moisture Content: 10.6%

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (grams)	Temperature on sample(°C)	Remarks, if any
1.	After 15	997	136	120-125	Drying Rate Started
2.	After 20	988	9	150	Required Drying Rate

Sample weight after drying: 988 grams
Total weight loss on drying: 145 grams
Final Moisture Content: 0.8%

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3. Trial No. 3:

Sample No: SWMPL/LR/1470/2020

Microwave Power: 1.6 kW

Setting Temperature: 80°C

Initial Weight: 1235 grams

Initial Moisture Content: 9.1%

Sr. No.	Time (minutes)	Weight noted (grams)	Total weight loss (grams)	Temperature on sample(°C)	Remarks, if any
1.	After 20	1108	127	145-150	Required Drying Rate

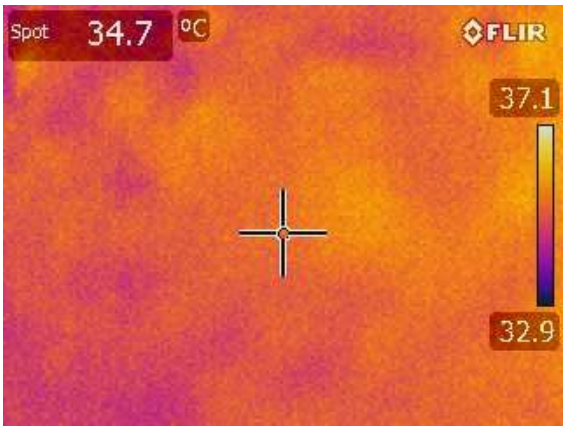
Sample weight after drying: 1108 grams

Total weight loss on drying: 127 grams

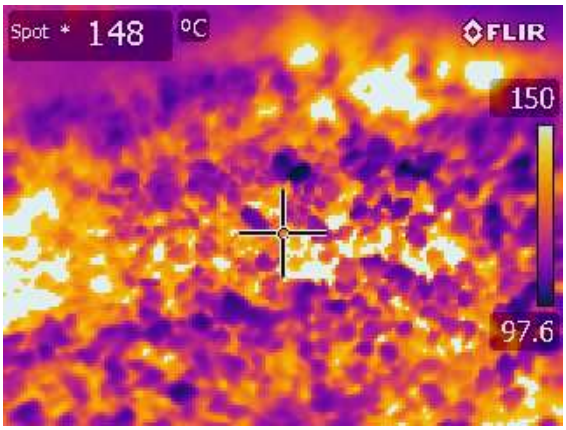
Final Moisture Content: NA

THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

Before Heat Treatment:



After Heat Treatment:



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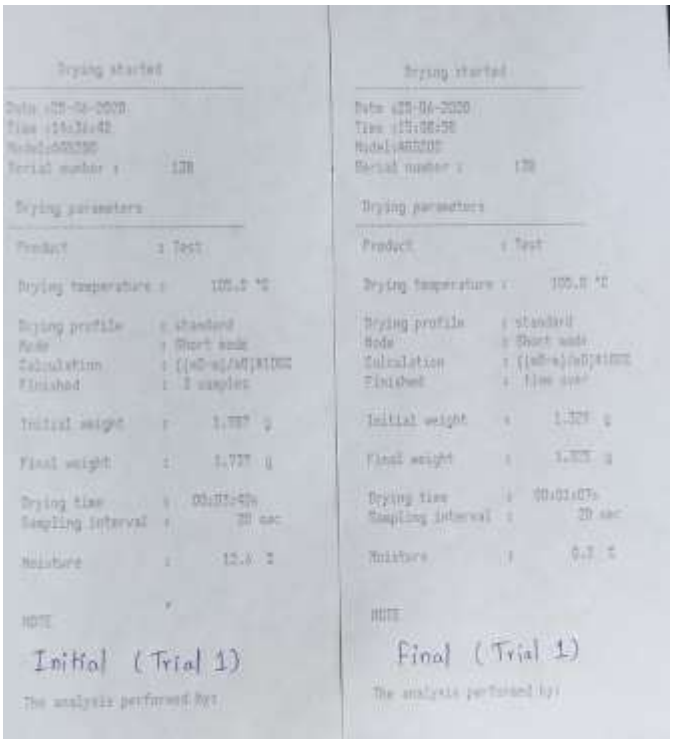
BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:

MOISTURE ANALYSIS REPORTS:

1) **Trial 1:**



Drying started

Drying parameters

Product : Test

Drying profile : standard

Initial (Trial 1)

Drying started

Drying parameters

Product : Test

Drying profile : standard

Final (Trial 1)

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2) Trial 2

3) Trial 3

OBSRVATIONS:

The Drying behavior of Bentonite granules has been investigated under the Batch 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 no colour change in sample with required final moisture content.

Miss. Komal Bhoite
Tested By