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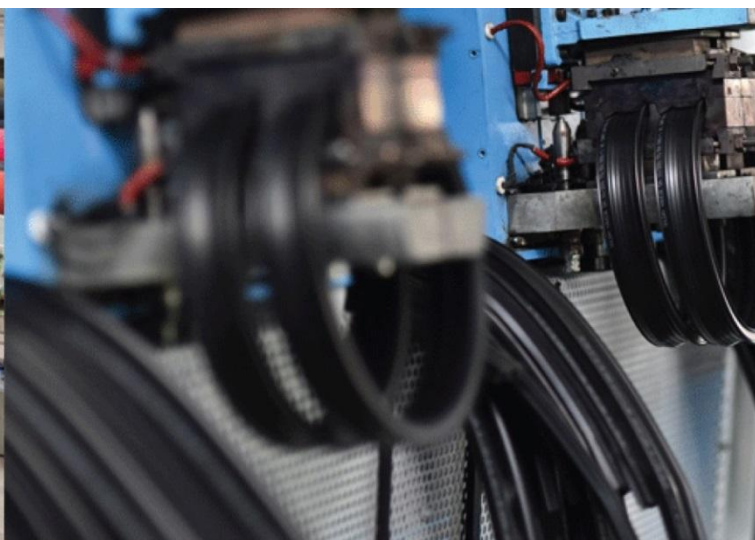
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ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),  
B/47, Addl. MIDC. Anand Nagar, Ambarnath (East), Thane- 421 506, India  
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**Batch Microwave+Convection Heat  
Treatment for Sterilization of Spices**

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



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Customer :	M/s. Anil & Company
Process :	Batch Microwave+Convection Heat Treatment for Sterilization of Spices

**TEST REPORT No: 47/KRDC/LAB/17 Mum 08/01/2020**

Date Sample reception : 08/01/2020

ID : 47/LAB/153

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 2 bags of 25 kg & 1 bag of 5 kg  
Sampling date : 08/01/2020  
Product : Spices Powder  
Requirement : Sterilization  
Start Date test : 08/01/2020  
End Date test : 08/01/2020

**LABORATORY EXPERIMENTAL SET UP:**



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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>	36°C ( $\pm$ 5°C)
<b>Humidity (%)</b>	$\leq$ 44% 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





## 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: $\pm^{\circ}\text{C}$ (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 Spices bags to speed up the heating rate for sterilization. For this experimental run, given packed bag has been placed in Batch Microwave Heating System and microwave exposure has been given with suitable parameters. Observations have been made on the basis of surface and core temperature of sample.

## ANALYTICAL RESULTS:

### 1. Trial No.1:

Bag Details: 5 kg Ploy bag

Microwave Power: 2 kW

Sr. No.	Type of Sample	Cycle Time (minutes)	Surface Temperature ( $^{\circ}\text{C}$ )	Core Temperature ( $^{\circ}\text{C}$ )
1.	Uninoculated sample	10	70-75	79
2.	Inoculated sample	12	90-95	80

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2. Trial No.2:

Bag Details: 25 kg Paper bag & HDPE bag with beneath 1 kg ploy bag.

Placement of bag: Paper bag was at front side and HDPE bag was at back side in chamber.

Microwave Power: 2 kW

Sr. No.	Bag Type	Cycle Time (minutes)	Surface Temperature (°C)	Core Temperature (°C)
1.	Paper Bag	60	55-75	60
	Beneath Ploy bag			75
2.	HDPE Bag	60	55-75	62
	Beneath Ploy bag			87

3. Trial No.3:

Bag Details: 25 kg Paper bag & HDPE bag

Placement of bag: Trial was taken separately on both the bags with loading at front side of chamber.

Microwave Power: 2 kW

Hot Air Temperature: 100°C

Note: Trial was taken with preheating the chamber at 100°C for 10 minutes.

Sr. No.	Bag Type	Cycle Time (minutes)	Surface Temperature (°C)	Core Temperature (°C)
1.	Paper Bag	30	60-70	NA
2.	HDPE Bag	30	55-65	NA

PICTURES TAKEN AFTER TRIALS:



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### OBSRVATIONS:

The heating behavior of Spices has been investigated under the Batch Microwave+Convection Heating System. The heating rate is found to be increasing with respect to increasing heating time. As per physical investigation, it has been observed that there is no colour change or burning effect on processed sample and also, no damage to bag.

*K Komal*

Miss Komal Bhoite  
Tested By