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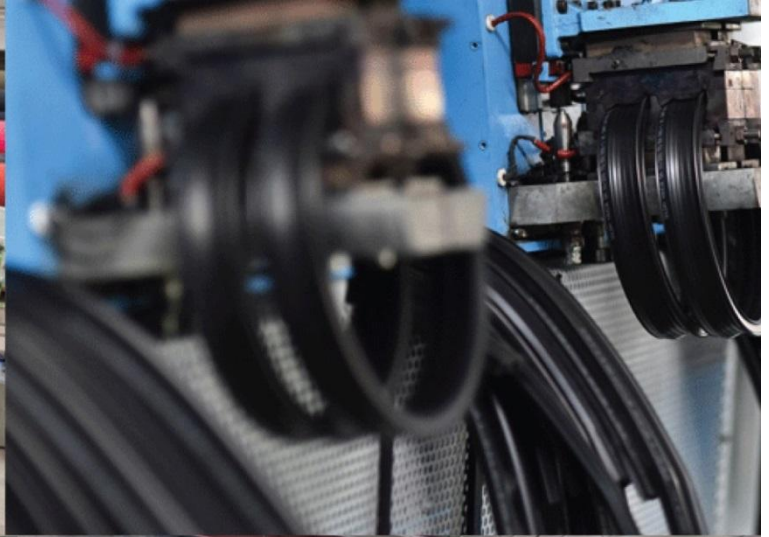
A.M.P.E.R.E (EUROPE)

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 & Microwave+Convection  
Heat Treatment for Sterilization of Breads**





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<b>Customer :</b>	<b>M/s. Cara Foods</b>
<b>Process :</b>	<b>Batch Microwave &amp; Microwave+Convection Heat Treatment for Sterilization of Breads</b>

**TEST REPORT No: 47/KRDC/LAB/17 Mum 15/11/2018**

Date Sample reception : 15/11/2018  
ID : 47/LAB/65

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 1 bag  
Sampling date : 15/11/2018  
Product : Breads  
Requirement : Core temperature of bread should be between 90-100°C  
Start Date test : 15/11/2018  
End Date test : 15/11/2018

**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>	27.8°C ( $\pm$ 5°C)
<b>Humidity (%)</b>	$\leq$ 63% 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



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### EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
<b>Compact Thermal Imaging Camera</b>		<b>Model :FLIR E-30</b> <b>Resolution: 160x 120IR</b> <b>Thermal sensitivity of 0.10°C</b>
<b>Digital Contact Thermometer</b>		<b>Model No: TM-902C</b> <b>Temperature range: -50~750°C</b> <b>Temperature accuracy: ±1°C</b>
<b>Moisture Analyzer</b>		<b>Make: Axis Balance</b> <b>Description:</b> <b>Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample&gt;5g)</b>
<b>Thermo Hygrometer</b>		<b>Model No: HTC-2</b> <b>Temperature accuracy: ±°C (1.8°F)</b> <b>Temperature resolution: 0.1°C (0.2°F)</b> <b>Humidity range: 10%~99% RH</b> <b>Humidity accuracy: ±5% RH</b> <b>Humidity resolution: 1% RH</b>

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### SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given bread samples without adding any additive to speed up the drying rate for sterilization treatment. For this experimental run, trials has been taken in two ways- a) Bread in sealed packing condition, b) In open bag and after trials sealed packed. The observations are made for various parameters for purely microwave treatment and also for microwave+convection treatment. Initial moisture content has been taken.

### ANALYTICAL RESULTS:

Initial Moisture Content: 32.1%

Trial No.	Power (kW)	Hot Air Temp(°C)	Cycle Time (minutes)	Core Temp(°C)	Sample packing	Remarks, if any
1.	1	80	2	91-93	Initially packed & then trial taken	More condensed water vapours has been observed inside the packing which is disturbing bread layers
2.	1.5	100	1	91-95		
3.	2	80	1	90-93		
4.	2	100	2	92-97		
5.	1	-	1	65-70	After trial sealed packing has been done and cold water bath has been given after packing	Due to very less content of condensed water vapours, bread texture remains unchanged
6.	1	-	1.5	80-85		
7.	1.5	-	1	75-80		
8.	1.5	-	1.5	90-92		
9.	2	-	1	90-93		



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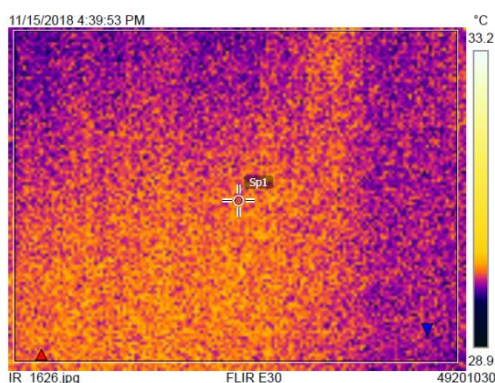
## THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

### 1. Before Heat Treatment:

Measurements		
Bx1	Max	30.4 °C
	Min	29.5 °C
	Average	30.0 °C
Sp1		30.0 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C

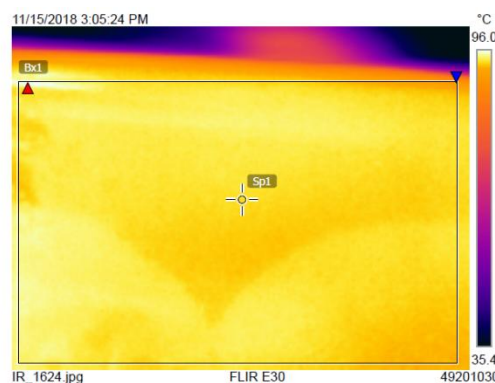


### 2. After Heat Treatment:

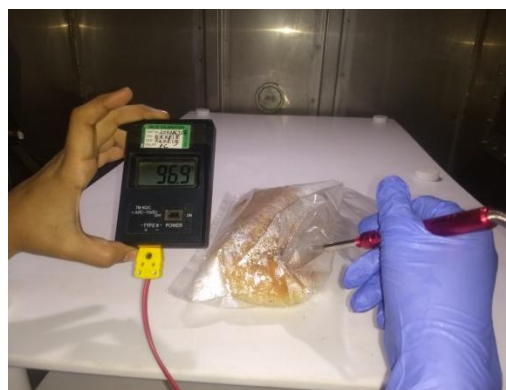
Measurements		
Bx1	Max	96.4 °C
	Min	90.9 °C
	Average	94.2 °C
Sp1		93.9 °C

Parameters	
Emissivity	0.95
Refl. temp.	20 °C



## PICTURES DURING TRIALS:



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#### OBSRVATIONS:

The Drying behavior of bread (of having no preservative) has been investigated under the microwave and microwave+convection heating system for sterilization treatment. The drying rate is found to be increasing with respect to increasing drying time. As per physical investigation, it has been observed that there is change in bread texture when packed bread undergoes microwave treatment, but if packing is done after microwave treatment there is no greater change observed in bread texture.

*K Komal*

Miss Komal Bhoite  
Tested By

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