KERONE

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Kerone Research & Development Centre (KRDC),
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Batch Microwave & Microwave+Convection Heat Treatment for Sterilization of Breads

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

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Customer :	**Laboratory Experimental Analysis**
Process :	**Batch Microwave & Microwave+Convection Heat Treatment for Sterilization of Breads**

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^{o}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:

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

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	27.8°C (±5°C)
Humidity (%)	≤63% 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
Digital Contact Thermometer		Model No: TM-902C Temperature range: -50~750°C Temperature accuracy: ±1°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

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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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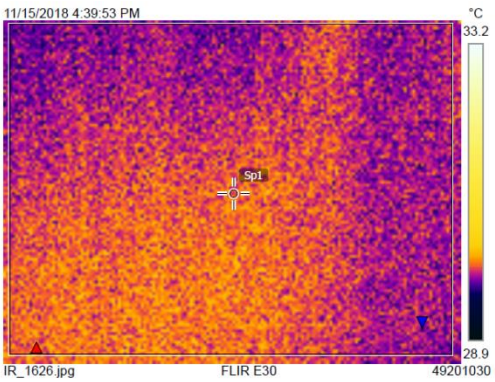
THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

1. Before Heat Treatment:

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

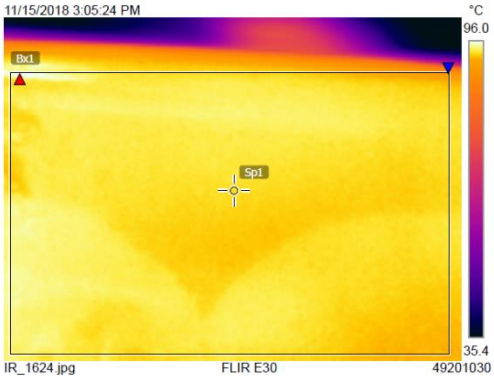
Parameters	
Emissivity	0.95
Refl. temp.	20 °C



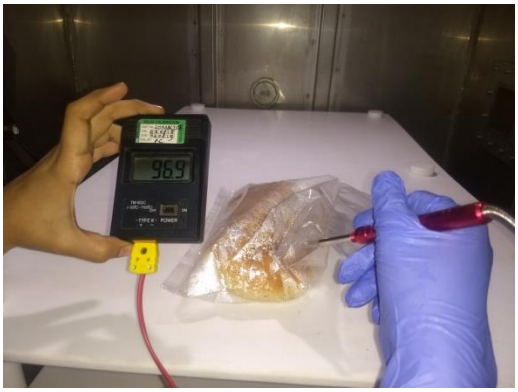
2. After Heat Treatment:

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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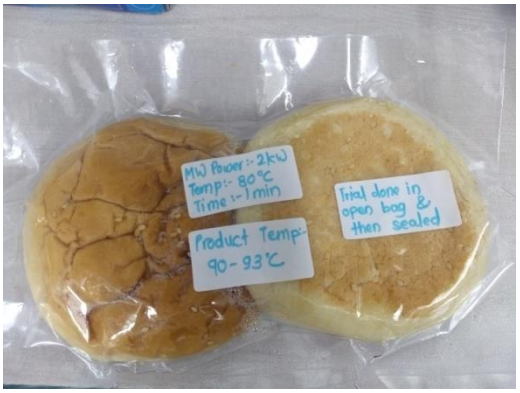

OBSRVATIONS:

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