

Kerone Research & Development Centre (KRDC), B/47, Addl. MIDC, Anandnagar, Ambernath (East), Thane- 421 506, India
Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com

Customer :	M/s. ATC Tires Private Limited
Process :	Batch Microwave Heat Treatment for Green Rubber Tire

TEST REPORT No: 47/KRDC/LAB/17 Mum 29/05/2018

Date Sample reception : 29/05/2018
ID : 47/LAB/41

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 1 No.
Sampling date : 07/06/2018
Product : Rubber tire
Requirement : After treatment, temperature inside the four layers of tire should be uniform around 90-95°C
Start Date test : 07/06/2018
End Date test : 07/06/2018

LABORATORY EXPERIMENTAL SET UP:



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LAB BATCH MICROWAVE HEATING SYSTEM SPECIFICATIONS:

Microwave Install Power	2 kW(CW)
Frequency	2450 MHz \pm 50
Convective Install 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)	28.1°C (\pm 5°C)
Humidity (%)	\leq 61% RH
Pressure (kN/m ² 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

EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
K-Type Thermometer		Make: FLUKE Model: 51 II

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Thermo Hygrometer		<p>Model No: HTC-2</p> <p>Temperature accuracy: $\pm^{\circ}\text{C}$ (1.8$^{\circ}\text{F}$) Temperature resolution: 0.1$^{\circ}\text{C}$ (0.2$^{\circ}\text{F}$)</p> <p>Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH</p>
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SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on green rubber tire in batch microwave heating system for pre-heating purpose. For this, green tire has been placed in microwave system for various time periods, power gain and temperature. Temperature inside the four layers of tire has been noted and is as follows.

ANALYTICAL RESULTS:

OD before trials: 630 mm

ID before trials: 295 mm

Initial Temperature of Tire: 31.2 $^{\circ}\text{C}$

Trial No.	Parameters	Temperature inside the Layers ($^{\circ}\text{C}$)			
		L1	L2	L3	L4
T1	Power: 1.8 kW. Set Temperature: 90 $^{\circ}\text{C}$; Time: 15 minutes.	68	94	62	66
T2	Power: 1.8 kW. Set Temperature: 100 $^{\circ}\text{C}$. Time: 15 minutes.	64	71	56	66
T3	Power: 2 kW. Set Temperature: 100 $^{\circ}\text{C}$. Time: 35 minutes.	100	100	68	69
T4	Power: 2 kW. Set Temperature: 100 $^{\circ}\text{C}$. Time: 45 minutes.	105	100	72	61

OD after trials: 640 mm

ID after trials: 290 mm

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BEFORE AND AFTER PICTURES OF TREATED GREEN TIRE SAMPLE:



OBSERVATIONS:

By the physical observation and temp-time profile readings, we recommend the changes in set up for further trials as follows –

1. Multimode cavity (microwave heads)
2. Microwave heads placements: On different sides required to achieve even temperatures.
3. Suggested Microwave installed Power is 6 kW (2 kW*3 nos) for faster temperature rise in rubber mass and inner most layer.
4. Support stands, handling base frame to modify to allowing more MW radiation for assisting base heating.



Miss. Komal Bhoite
Tested By

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