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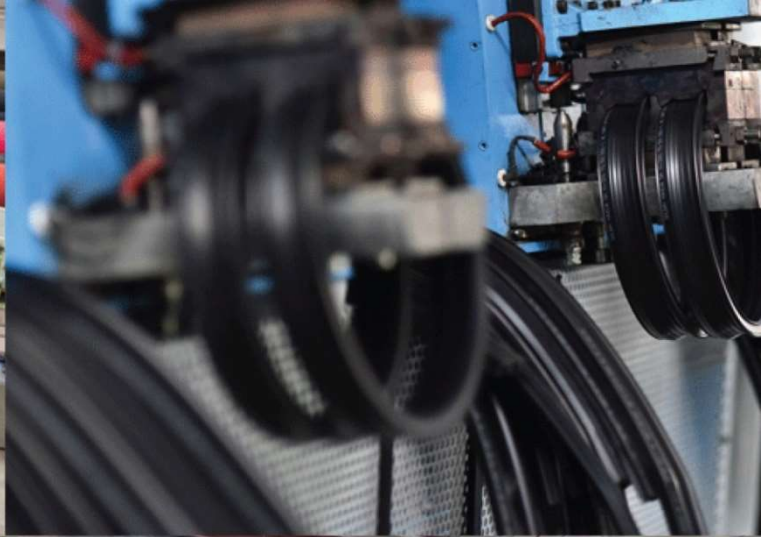
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ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),  
B/47, Addl. MIDC. Anand Nagar, Ambarnath (East), Thane- 421 506, India  
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com



**Batch Microwave+Convection Heat  
Treatment for Drying of Medicine Powders**



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Customer :	M/s. Granules India Limited
Process :	Batch Microwave+Convection Heat Treatment for Drying of Medicine Powders

**TEST REPORT No: 47/KRDC/LAB/17 Mum 24/12/2018**

Date Sample reception : 24/12/2018  
ID : 47/LAB/75

**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : Paracetamol-75 kg & Metformin-80 kg  
Sampling date : 07/01/2019  
Product : Paracetamol Powder & Metformin Powder  
Requirement : Final product must have moisture content less than or equal to 0.5%  
Start Date test : 07/01/2019  
End Date test : 08/01/2019

**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>	28.1°C ( $\pm$ 5°C)
<b>Humidity (%)</b>	$\leq$ 63% RH
<b>Pressure (kN/m2 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
Infrared Thermometer		Model: FLUKE 566 Temperature Range: -40°C to 650°C Display Resolution: 0.1°
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

### SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Paracetamol powder and Metformin powder separately without adding any additive to speed up the drying rate. For this experimental run, particular quantity of

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sample has been taken in microwave transparent tray with uniform thickness and this powder loaded tray has been placed in heating system with different setting parameters. The observations are made on the basis of LOD and moisture content.

## ANALYTICAL RESULTS:

### 1. Paracetamol:

Initial Moisture Content: 5.6%

	Trail No. 1		Trial No.2	Trial No.3	Trial No. 4	
	Initial 15 minutes	Next 15 minutes			Initial 15 minutes	Next 15 minutes
Microwave Power (kW)	1	1.5	2	2	2	2
Setting Temperature (°C)	80	80	110	140	140	140
Cake Thickness (mm)	10	10	20	15	15	15
Cycle Time (minutes)	15	(15+)15	15	20	15	(15+)15
Initial Weight (grams)	350	340	398	602	532	498
Final Weight (grams)	340	338	380	562	498	489
Temp. on Product after treatment (°C)	42-45	50-55	55-58	60-65	60-65	70-80
Final Moisture content (%)	3.6	0.47	1.1	0.5	2.1	0.2

### 2. Metformin:

Initial Weight: 570 grams

Initial Moisture Content: 0.8%

Microwave Power: 2 kW

Setting Temperature: 140°C

Cycle Time: 5 minutes

Final Weight: 549 grams

Final Moisture Content: 0%



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## MOISTURE ANALYSIS REPORTS:

### 1. Paracetamol:

Drying started		Drying started		Drying started		Drying started	
Date : 7-01-2019	Time : 15:47:20	Date : 7-01-2019	Time : 17:49:45	Date : 7-01-2019	Time : 16:53:34	Date : 7-01-2019	Time : 18:29:13
Model: AGS200	Serial number : 138	Model: AGS200	Serial number : 138	Model: AGS200	Serial number : 138	Model: AGS200	Serial number : 138
Drying parameters		Drying parameters		Drying parameters		Drying parameters	
Product : Test	Drying temperature : 105.0 °C	Product : Test	Drying temperature : 105.0 °C	Product : Test	Drying temperature : 105.0 °C	Product : Test	Drying temperature : 105.0 °C
Drying profile : standard	Mode : Short mode	Drying profile : standard	Mode : Short mode	Drying profile : standard	Mode : Short mode	Drying profile : standard	Mode : Short mode
Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples	Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples	Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples	Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples
Initial weight : 0.947 g	Final weight : 0.894 g	Initial weight : 0.805 g	Final weight : 0.801 g	Initial weight : 0.543 g	Final weight : 0.537 g	Initial weight : 0.504 g	Final weight : 0.505 g
Drying time : 00:02:00s	Sampling interval : 20 sec	Drying time : 00:01:40s	Sampling interval : 20 sec	Drying time : 00:01:40s	Sampling interval : 20 sec	Drying time : 00:01:40s	Sampling interval : 20 sec
Moisture : 5.4 %		Moisture : 0.5 %		Moisture : 1.1 %		Moisture : 0.2 %	
NOTE Initial		NOTE Final (Trial No.3)		NOTE Final (Trial No.2)		NOTE Final (Trial No.4)	
The analysis performed by:		The analysis performed by:		The analysis performed by:		The analysis performed by:	
Signature: <u>KKomal</u>		Signature: <u>KKomal</u>		Signature: <u>KKomal</u>		Signature: <u>KKomal</u>	

### 2. Metformin:

Drying started		Drying started	
Date : 7-01-2019	Time : 18:48:20	Date : 7-01-2019	Time : 18:45:08
Model: AGS200	Serial number : 138	Model: AGS200	Serial number : 138
Drying parameters		Drying parameters	
Product : Test	Drying temperature : 105.0 °C	Product : Test	Drying temperature : 105.0 °C
Drying profile : standard	Mode : Short mode	Drying profile : standard	Mode : Short mode
Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples	Calculation : $\frac{(m_0-m)/m_0}{100}$	Finished : 3 samples
Initial weight : 0.504 g	Final weight : 0.500 g	Initial weight : 0.509 g	Final weight : 0.602 g
Drying time : 00:01:40s	Sampling interval : 20 sec	Drying time : 00:01:40s	Sampling interval : 20 sec
Moisture : 0.8 %		Moisture : 0.0 %	
NOTE Initial		NOTE Final	
The analysis performed by:		The analysis performed by:	
Signature: <u>KKomal</u>		Signature: <u>KKomal</u>	

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The value obtained is already corrected for possible recover value stated, if applicable. This document may not be reproduced or disclosed wholly or partly in any part thereof without the written consent of the laboratory management or customer. This document relates only to the specimen samples processed. The processed sample will be kept in this laboratory for 7 days from the date of heat treatment.



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#### **OBSRVATIONS:**

The Drying behavior of Paracetamol powder and Metformin powder has been investigated under the 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 complete drying with required moisture content without colour change.

As discussed and further suggestion received from you for more trials testing will done on your samples in large quantities and same along with reports will be submitted you in coming week for ready reference.

Based on samples submission and feedbacks from your laboratory tests and acceptance, will then proceed for submittal of techno-commercial offer for drying solutions.

Miss Komal Bhoite  
Tested By

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