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ISO-9001-2008 COMPANY

Member Of



AIMCAL (USA)



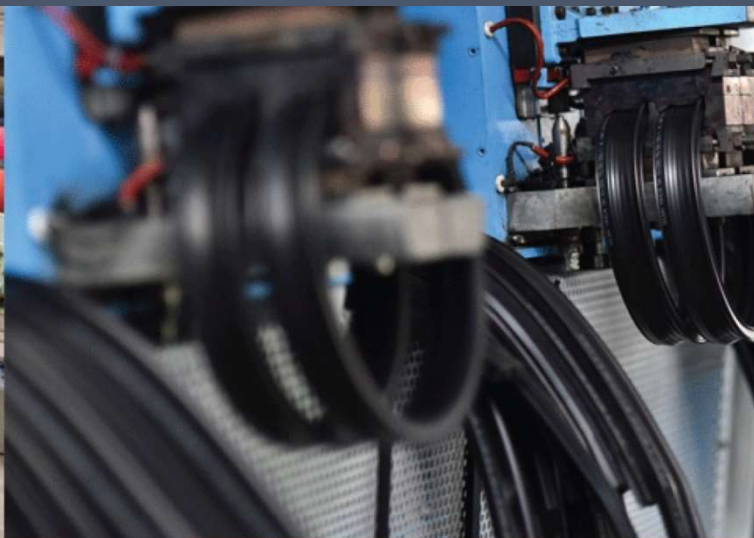
A.M.P.E.R.E (EUROPE)

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 Convection Heat Treatment  
for Drying of Dates**

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



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Customer :	M/s. Al Barakah Dates Factory Dubai, U.A.E.
Process :	Batch Convection Heat Treatment for Drying of Dates

### TEST REPORT No: 47/KRDC/LAB/17 Mum 26/10/2018

Date Sample reception : 26/10/2018  
ID : 47/LAB/71

### SAMPLE DESCRIPTION:

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 1box  
Sampling date : 22/12/2018  
Product : Dates  
Requirement : Final product must have minimum moisture content  
Start Date test : 22/12/2018  
End Date test : 27/12/2018

### LABORATORY EXPERIMENTAL SET UP:



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**LAB BATCH CONVECTION HEATING SYSTEM SPECIFICATIONS:**

Heating Zone (width*height*depth)	510*480*410 mm
No. of Heaters	6
Total Heater Power	6 kW
Motor	0.5 HP
Centrifugal Exhaust Blower	1440 rpm
Vacuum Blower	0.85kW
No. of trays	6
Tray size (width*height*depth)	560*25*435 mm

**ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:**

Temperature (degree C)	28.1°C (±5°C)
Humidity (%)	≤64% 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

**EQUIPMENTS USED:**



Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120 IR Thermal sensitivity of 0.10°C

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<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: <math>\pm^{\circ}\text{C}</math> (1.8<math>^{\circ}\text{F}</math>)</b> <b>Temperature resolution: 0.1<math>^{\circ}\text{C}</math> (0.2<math>^{\circ}\text{F}</math>)</b> <b>Humidity range: 10%~99% RH</b> <b>Humidity accuracy: <math>\pm 5\%</math> RH</b> <b>Humidity resolution: 1% RH</b>

### SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on given dates without adding any additive to speed up the drying rate. For this experimental run, the given sample of dates has been placed on dehydrator tray and the loaded tray placed in heating system with suitable setting parameters. The observations are made on LOD basis. Also, initial weight before drying, final weight after drying, initial moisture content, final moisture content after heat treatment has been noted.

### ANALYTICAL RESULTS:

Setting Temperature: 70 $^{\circ}\text{C}$

Initial Moisture Content: 3.5%

Initial Weight: 950 grams

Sr. No.	Time (hours)	Weight noted (grams)	Total weight loss (%)	Temperature on sample( $^{\circ}\text{C}$ )	Remarks, if any
1.	After 20	875	7.89	56.7	Drying rate started
2.	After 40	867	8.74	58.9	Drying phase continue
3.	After 60	858	9.68	61.2	Variant of Drying rate
4.	After 80	854	10.1	65.6	Variant of Drying rate

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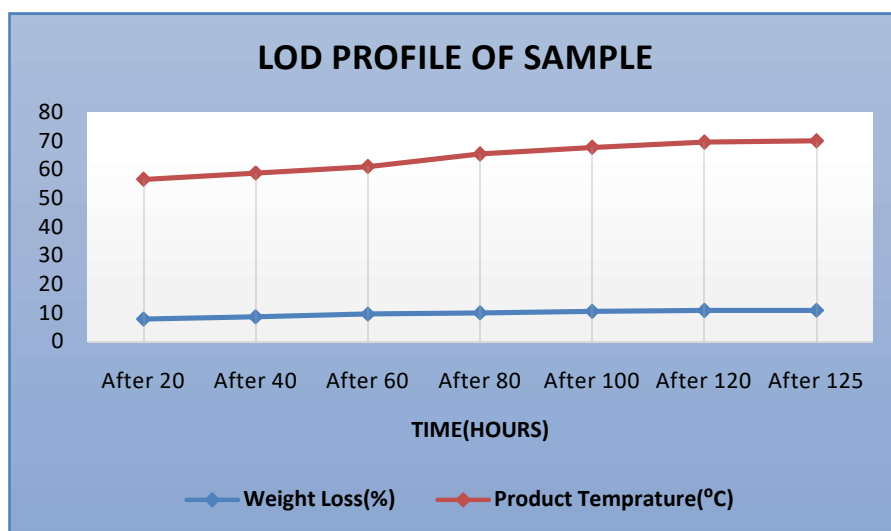
5.	After 100	849	10.63	67.9	Variant of Drying rate
6.	After 120	846	10.95	69.7	Variant of Drying rate
7.	After 125	845	11	70.3	Required Drying rate

Sample weight after drying: 845 grams

Total weight loss on drying: 11%

Final Moisture Content: 0.3%

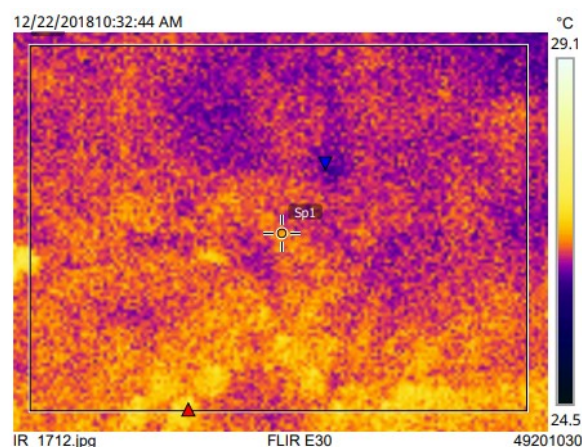
### GRAPHICAL REPRESENTATION OF DRYING PARAMETERS:



### THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

#### 1. Before Heat Treatment:

Measurements		
Bx1	Max	27.5 °C
	Min	26.1 °C
	Average	26.8 °C
Sp1		27.2 °C
Parameters		
Emissivity		0.95
Ref. temp.		20 °C



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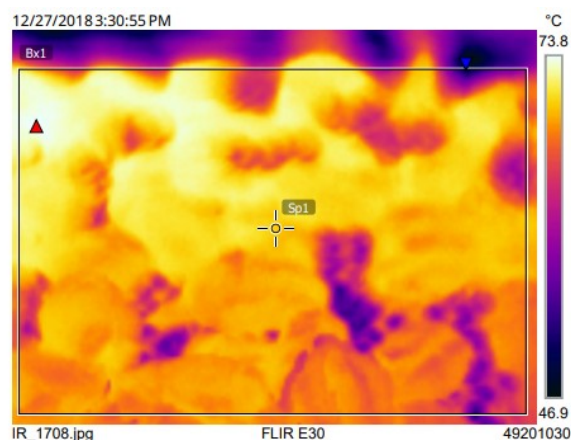
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## 2. After Heat Treatment:

Measurements		
Bx1	Max	73.9 °C
	Min	50.5 °C
	Average	68.8 °C
Sp1		70.3 °C
Parameters		
	Emissivity	0.95
	Ref. temp.	20 °C



## MOISTURE ANALYSIS REPORTS:

Drying started		Drying started	
Date : 20-12-2018		Date : 1-01-2019	
Time : 11:10:50		Time : 10:25:11	
Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters	
Product : Test		Product : Test	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode	
Calculation : $((m_0 - m) / m_0) * 100\%$		Calculation : $((m_0 - m) / m_0) * 100\%$	
Finished : 3 samples		Finished : 3 samples	
Initial weight : 2.309 g		Initial weight : 3.208 g	
Final weight : 2.229 g		Final weight : 3.199 g	
Drying time : 00:16:00s		Drying time : 00:01:40s	
Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 3.5 %		Moisture : 0.3 %	
NOTE Initial		NOTE Final	
The analysis performed by:		The analysis performed by:	
Signature: <i>KKomal</i>		Signature: <i>KKomal</i>	

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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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#### BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:



#### OBSERVATIONS:

The drying behavior of dates has been investigated under the batch 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 in drying time. As per physical investigation, it has been observed that there is crunchiness in texture without change in colour and without burning.

Please note drying time further can be reduced if dehumidified intake air used on the dryer chamber for acceleration of drying process. Total drying cycle within 72 hours can be achievable for some even better product properties.

Miss Komal Bhoite  
Tested By