



**PLUSS<sup>®</sup>**  
TECHNOLOGY FOR  
A BETTER WORLD

**UNIDO - FLCTD Demonstration Summary**

## INNOVATION OBJECTIVES

---

1. Offer a temperature retention period of at least 16 hours during a power outage or absence of electrical source.
  2. Maintain a constant & uniform temperature across the freezer/cooler chamber.
  3. Reduce the energy consumption during operation.
  4. Make it user friendly from the point of integration during manufacturing.
-

## TEST DETAILS

Location of tests	No of units tested	Duration of test
ICEMAKE INDIA, Ahmedabad	2 freezers	2-3 weeks
ANAND REFRIGERATION, New Delhi	2 coolers	2-3 weeks
MILKBASKET, Gurugram	2 freezers and 2 coolers	4-5 weeks
FARE LABS (NABL Lab), Gurugram	2 freezers and 2 coolers	1 week

## REFRIGERATION UNITS UNDER OBSERVATION



Chest Freezers- with and without PCM, installed at Fare Labs (NABL accredited lab), Gurugram



Chest Coolers - with and without PCM, installed at Anand Refrigeration, New Delhi



## REFRIGERATION UNITS UNDER OBSERVATION (contd.)



*With and without PCM freezers and coolers installed at MilkBasket, Gurugram*



*With and without PCM freezers installed at ICEMAKE Refrigeration, Ahmedabad*

# TESTING SUMMARY

## Freezers

### Freezers at Icemake Refrigeration, Ahmedabad

Load operating conditions		%age Energy savings	With PCM freezer Retention time (hours)	% reduction in compressor operation
With Load	Without Air changes*	12.34	24	27.9
	With Air changes	12.7		19.79
Without Load	Without Air changes	7.2	20.8	11
	With Air changes	1.07		11.22

## Coolers

### Coolers at Anand Refrigeration, Delhi

Load operating conditions		%age Energy savings	With PCM Cooler Retention time (hours)	% reduction in compressor operation
With Load	Without Air changes	13.17	2.83	32.32
	With Air changes	18.18		19
Without Load	Without Air changes	21.47	3.8	23.65
	With Air changes	14.5		25.71

\*Air changes condition: The doors of devices are kept open for 5 minutes every hour for continuously 8 hours

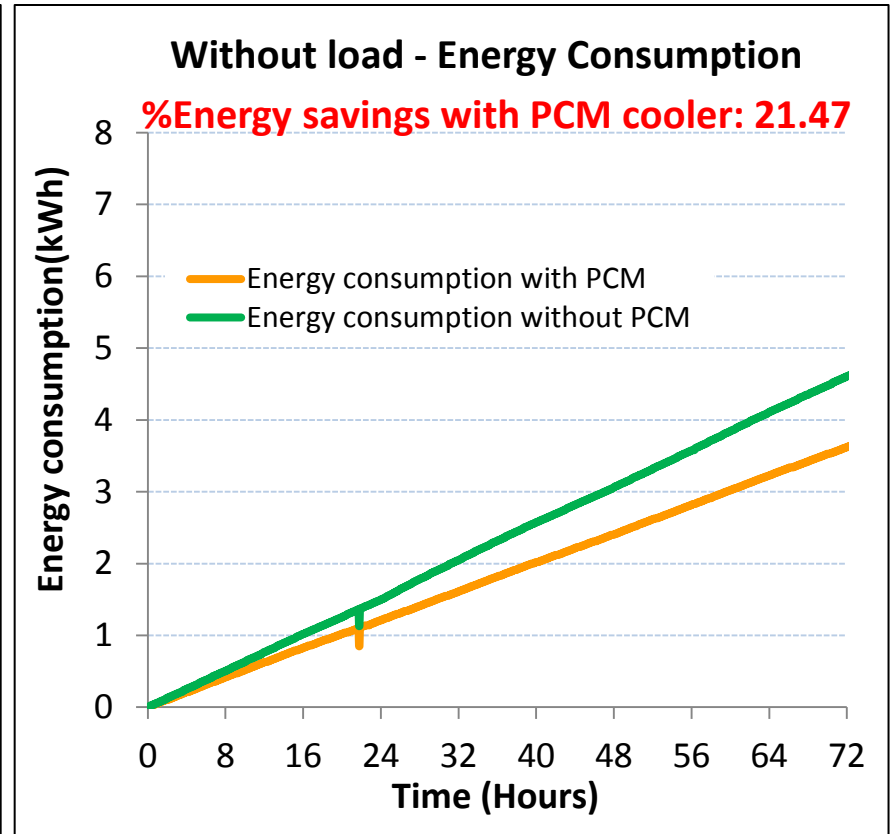
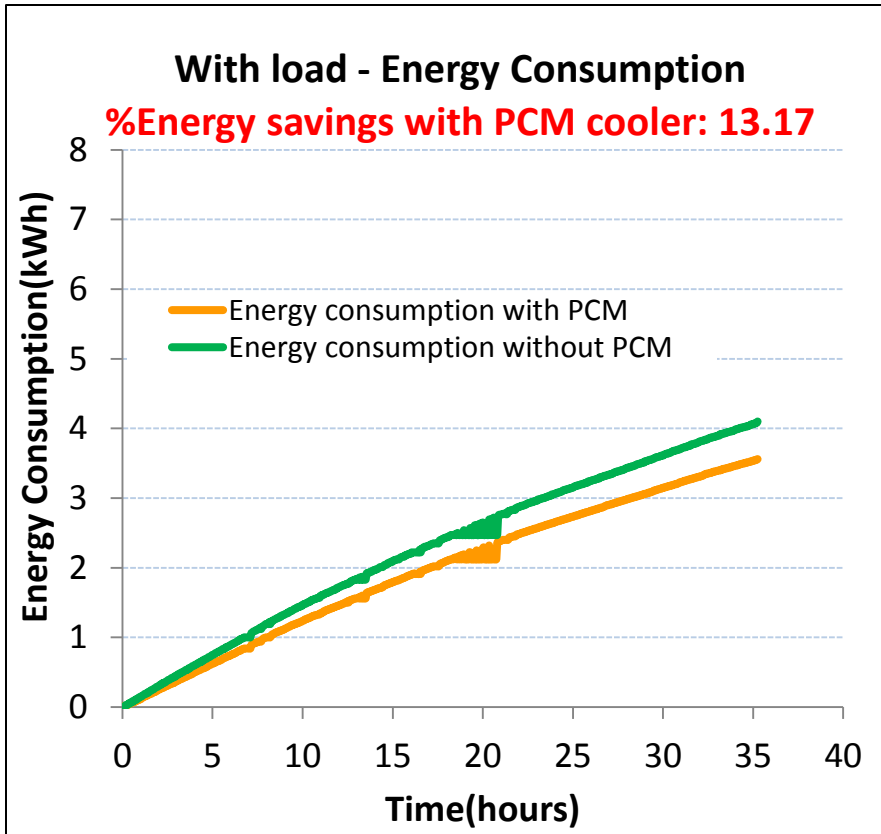


Confederation of Indian Industry

# Supporting graphs and data for the demonstrations

# 1. TESTING RESULTS OF COOLERS AT ANAND REFRIGERATION, NEW DELHI

## 1.1 Energy Consumption comparison of Coolers with and without Load\*

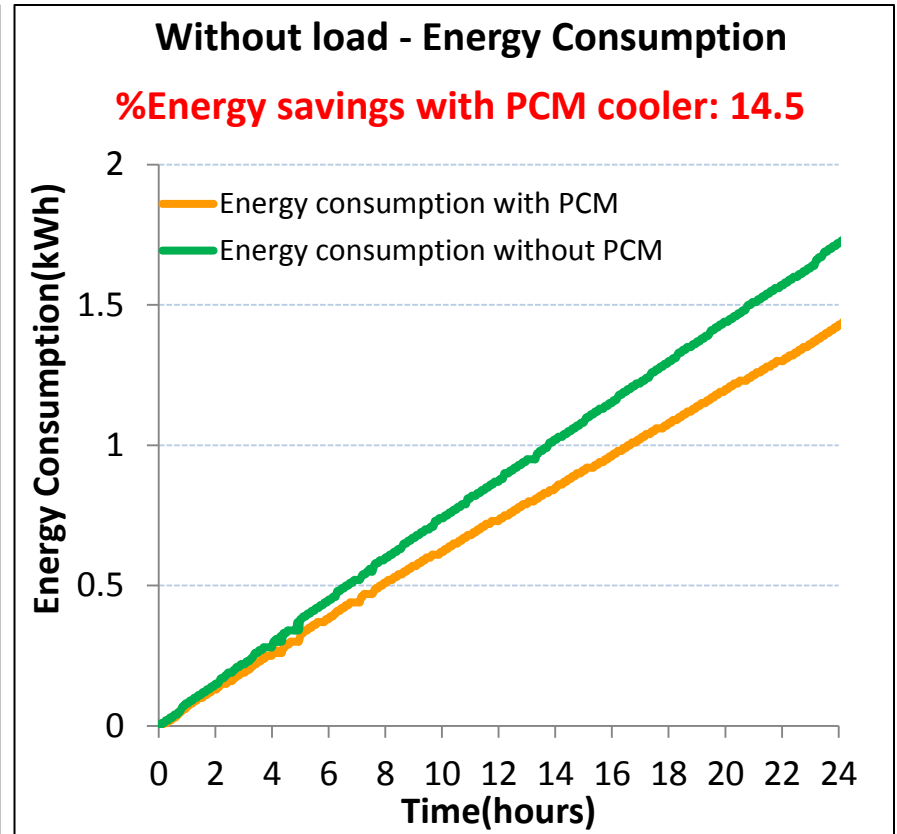
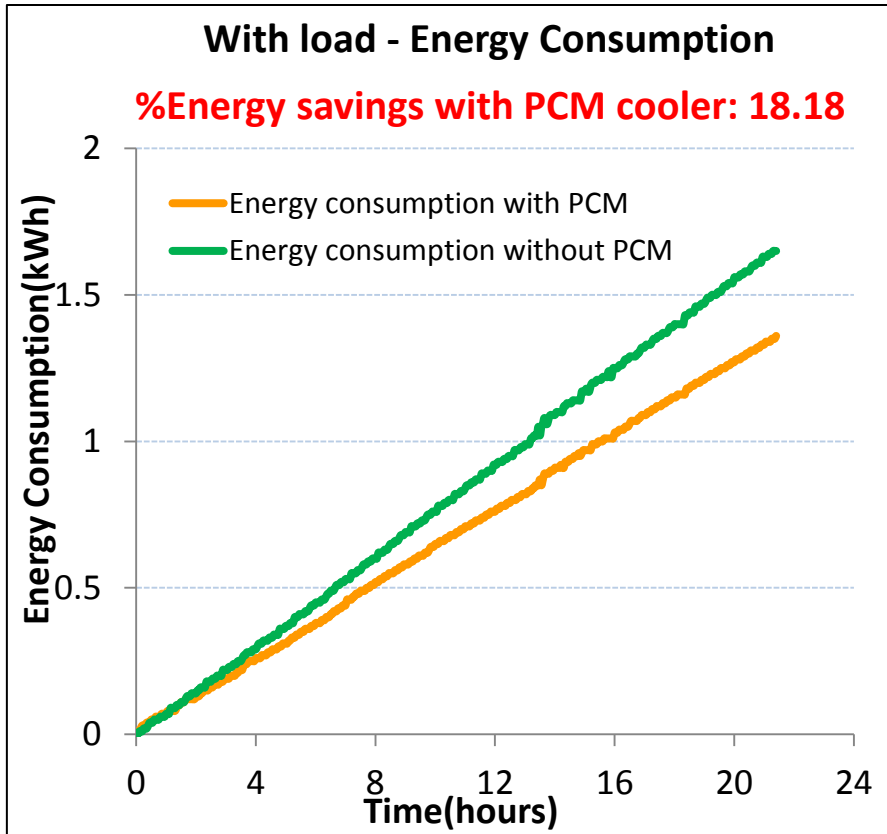


(\*The test was conducted without opening and closing of cooler's door/lid; Product loaded in cooler was 90L water)



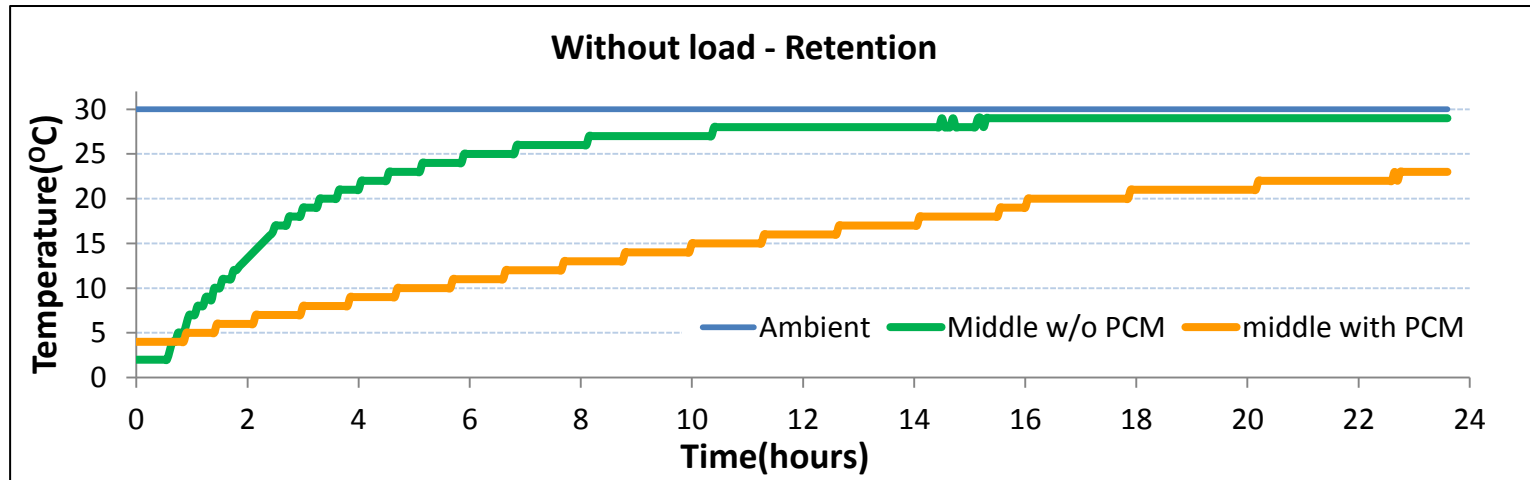
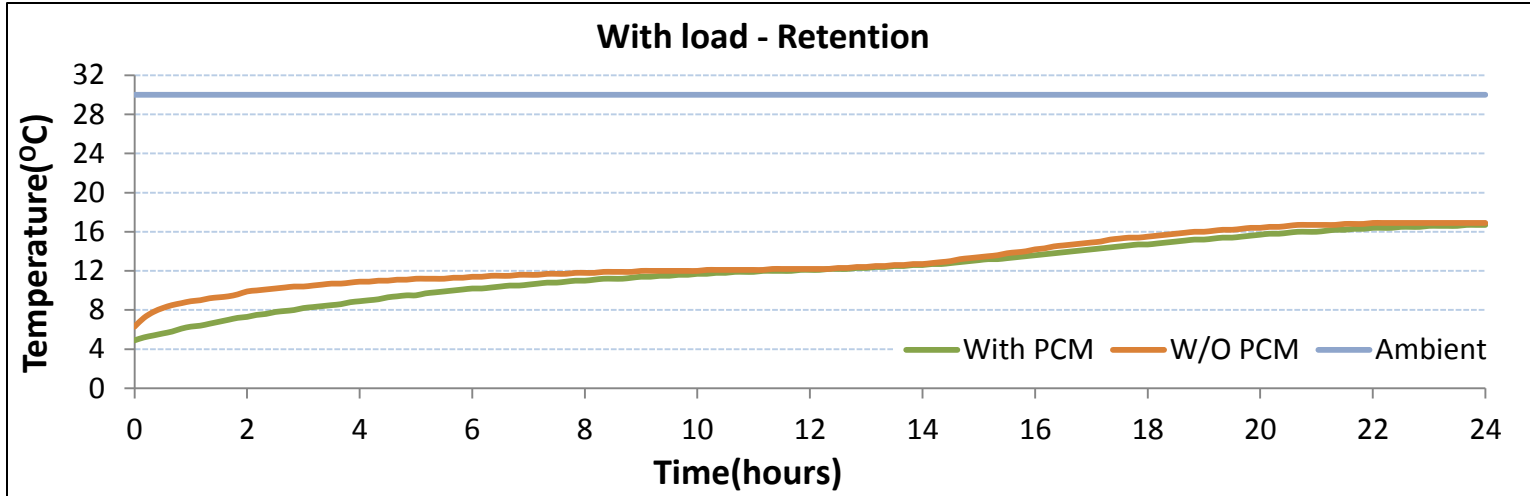
# CONTD...

## 1.2 Energy Consumption comparison of Coolers with and without Load\*



(\*The test was conducted with regular openings and closings of cooler's door/lid)

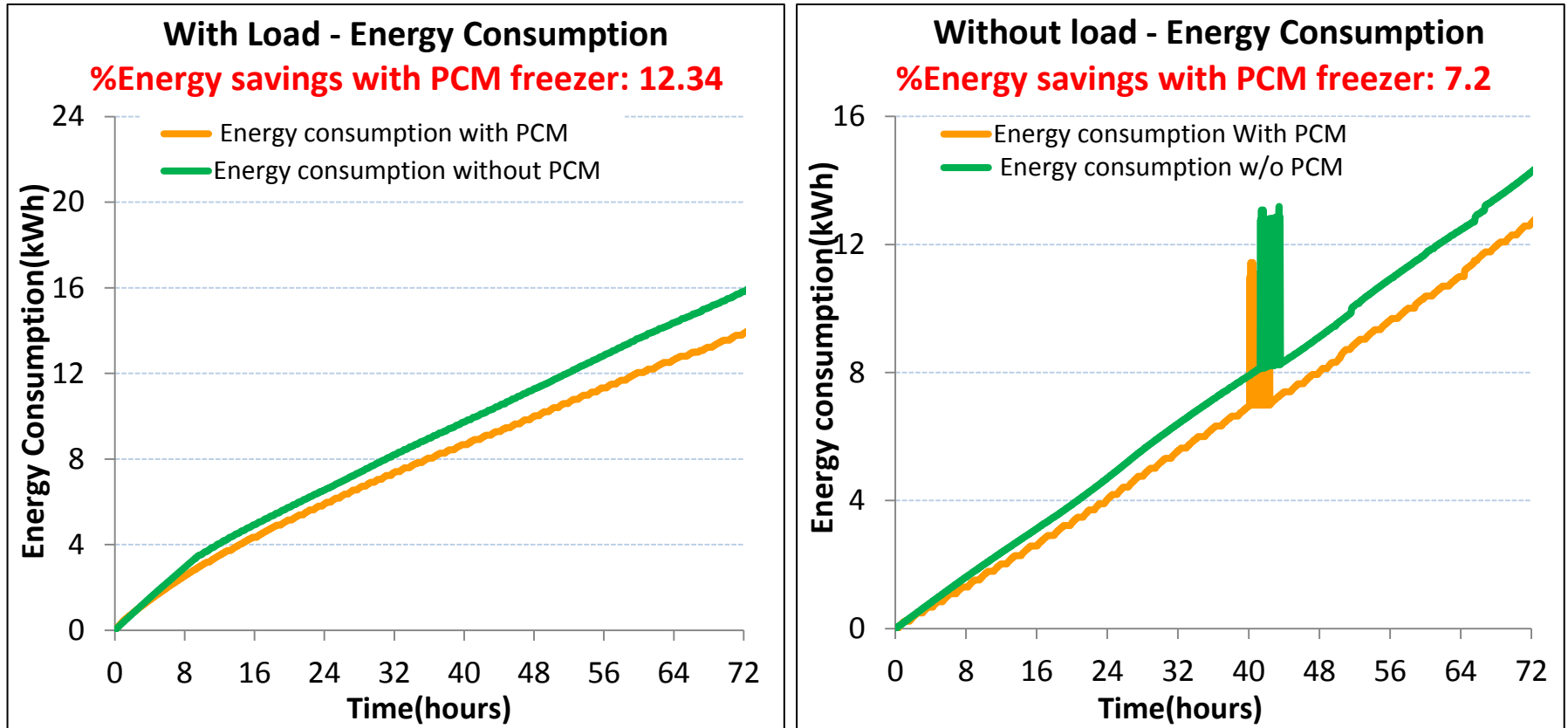
### 1.3 Temperature retention curve of Coolers with and without Load



Desired temperature to be maintained inside the cooler is 2 to 8°C

## 2. TESTING RESULTS OF FREEZERS AT ICEMAKE REFRIGERATION, AHMEDABAD

### 2.1 Energy Consumption comparison of Freezers with and without Load\*

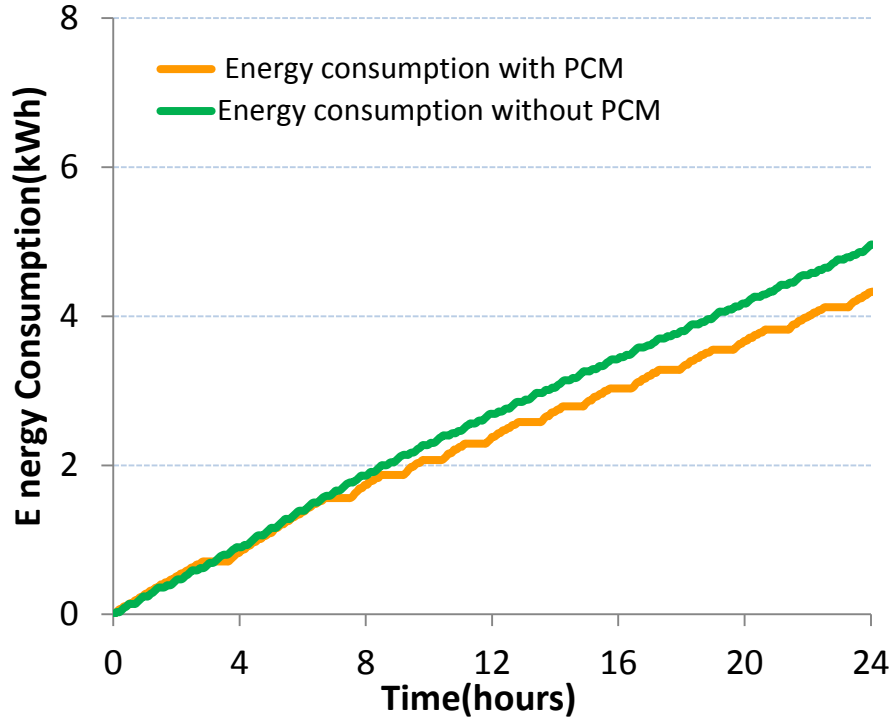


(\*Test was conducted without opening and closing of freezers' door/lid and frozen product loaded in freezers was 50 kg)

## 2.2 Energy Consumption comparison of Freezers with and without Load\*

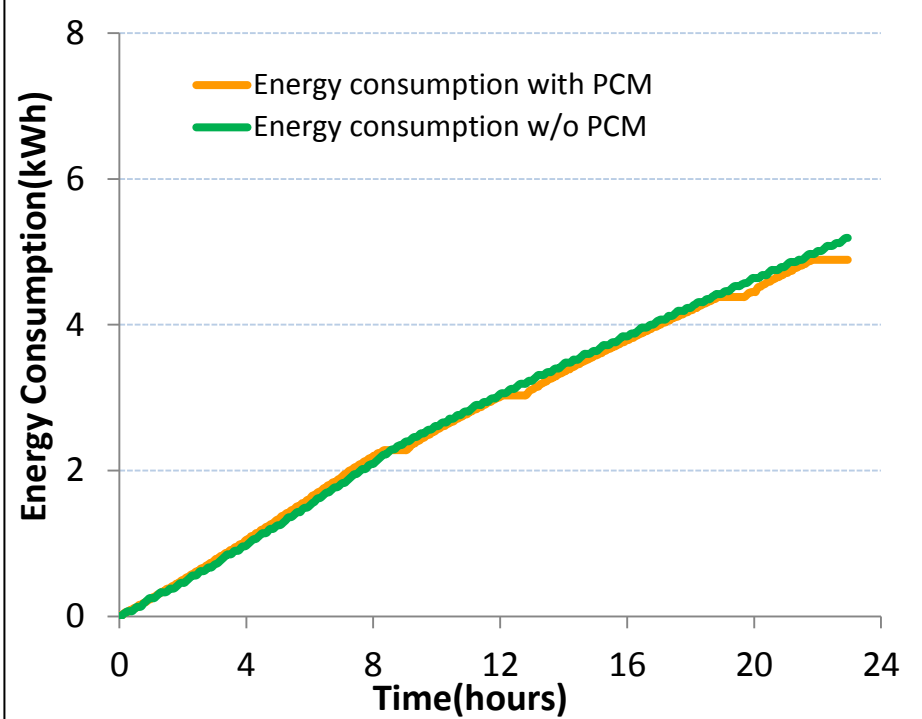
### With load - Energy Consumption

**%Energy savings with PCM freezer: 12.7**



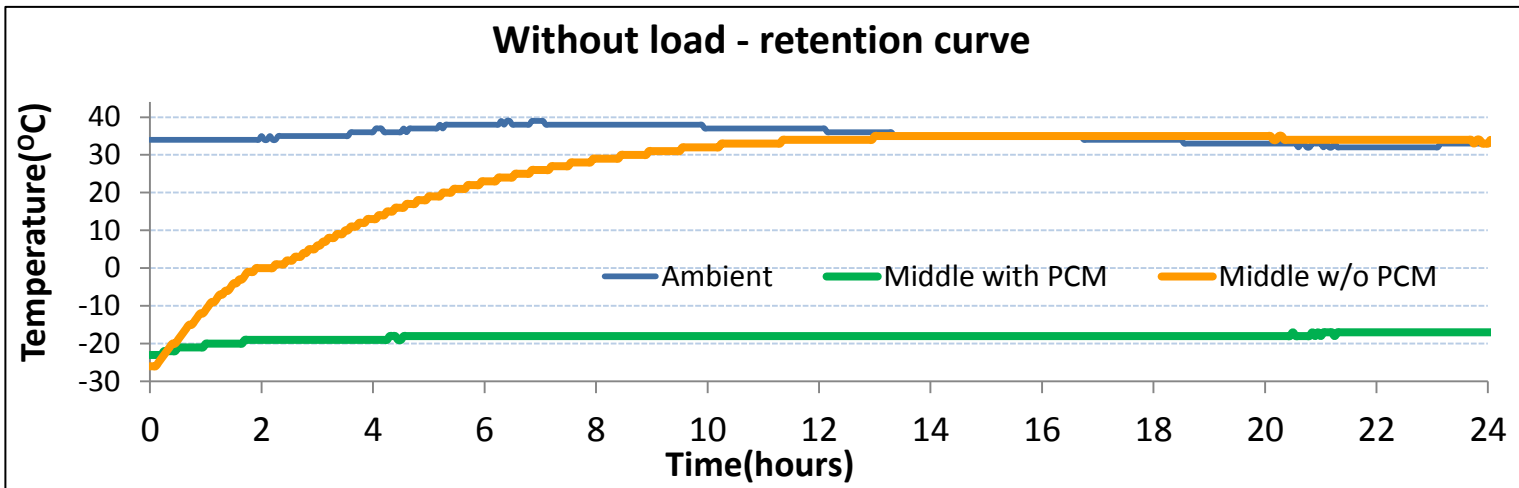
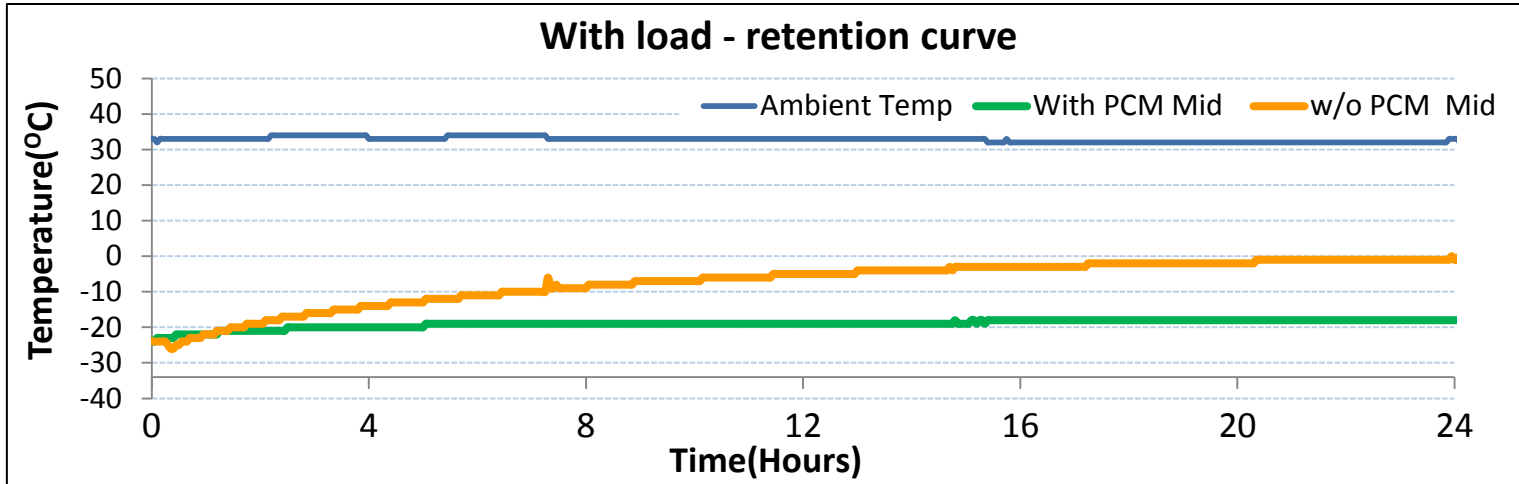
### Without load - Energy consumption

**%Energy savings with PCM freezer: 1.07**



(\*The test was conducted with regular openings and closings of freezers' door/lid)

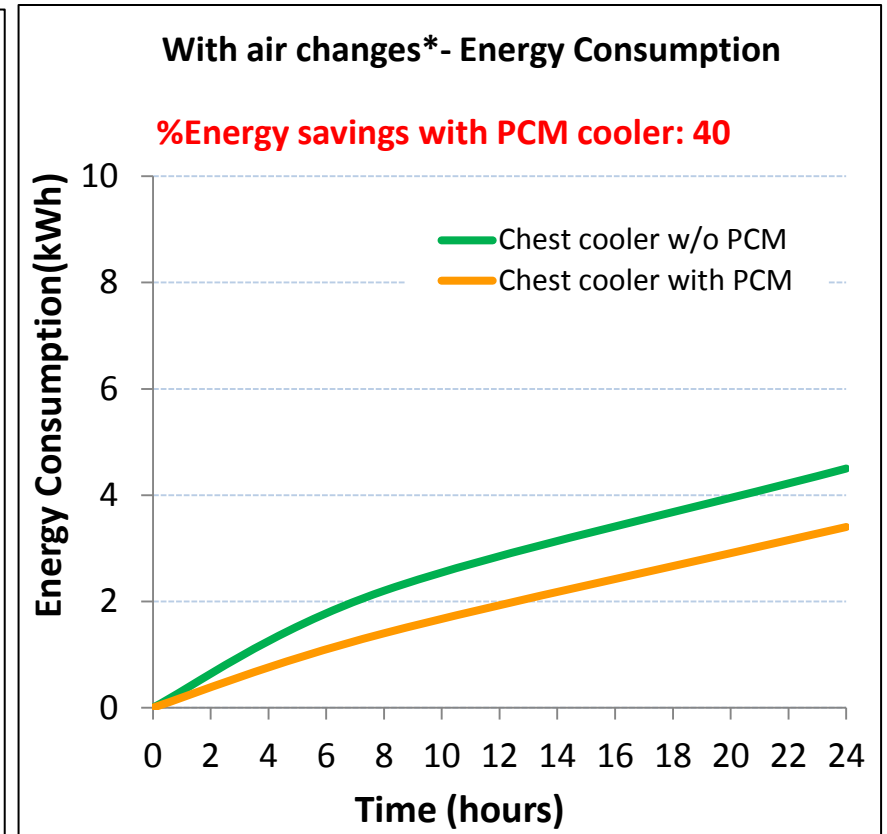
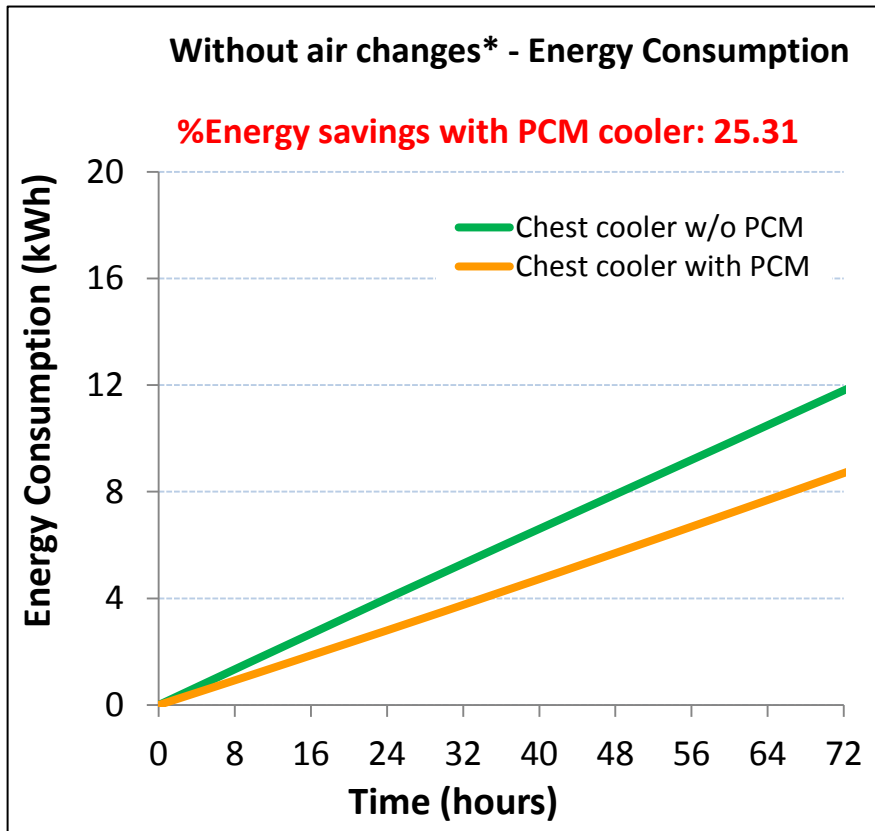
## 2.3 Temperature retention curve of Freezers with and without Load



Desired temperature to be maintained inside the freezers is -18 to -23 °C

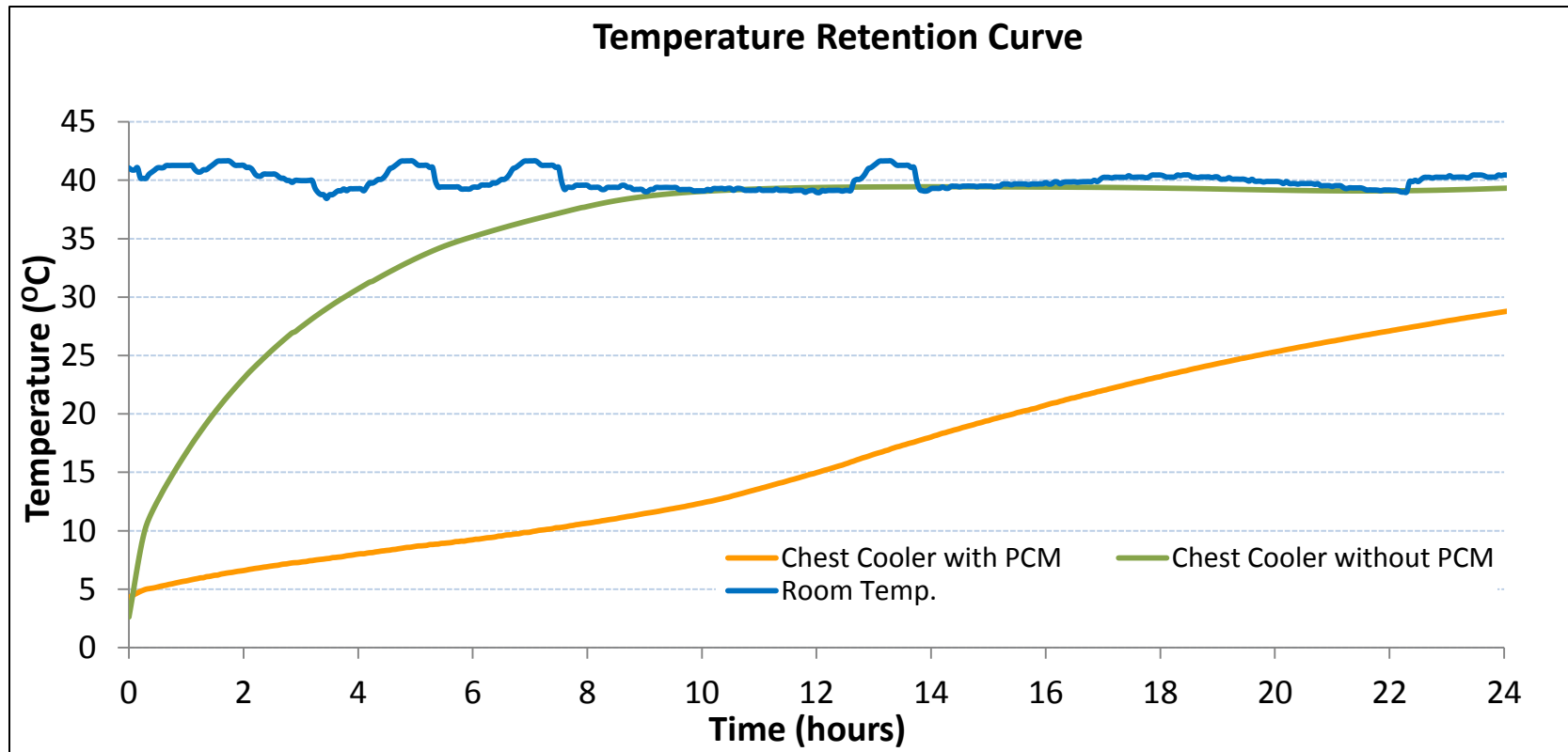
### 3. TESTING RESULTS OF COOLERS AT FARE LABS, GURUGRAM

#### 3.1 Energy Consumption comparison of Coolers without Load



(\*Air Changes : Regular opening and closing of cooler's door/lid)

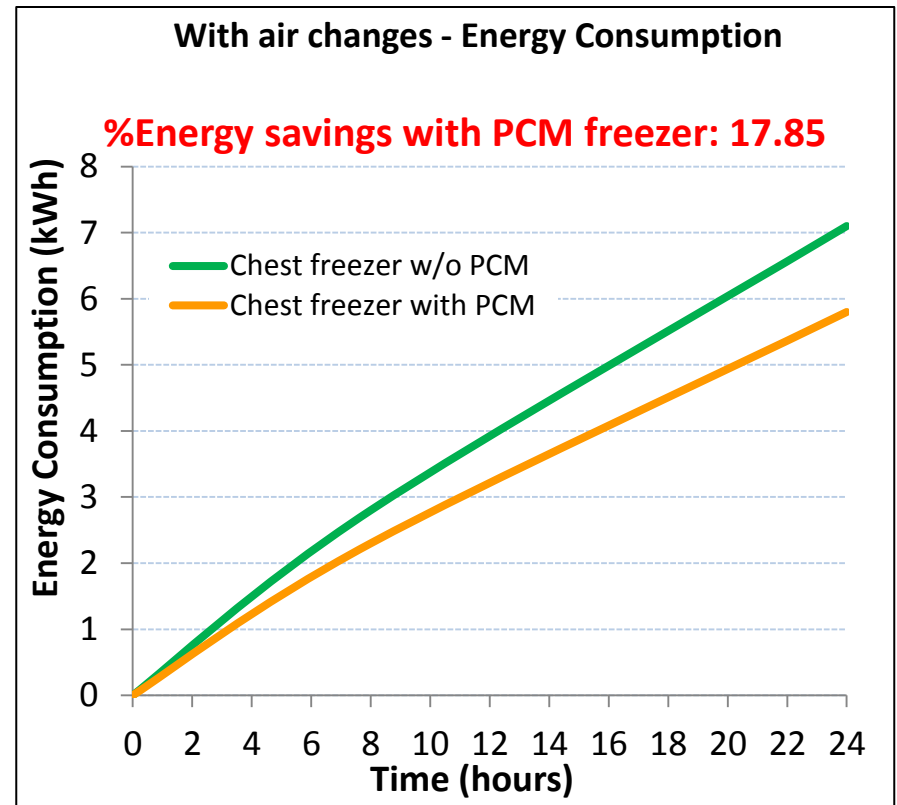
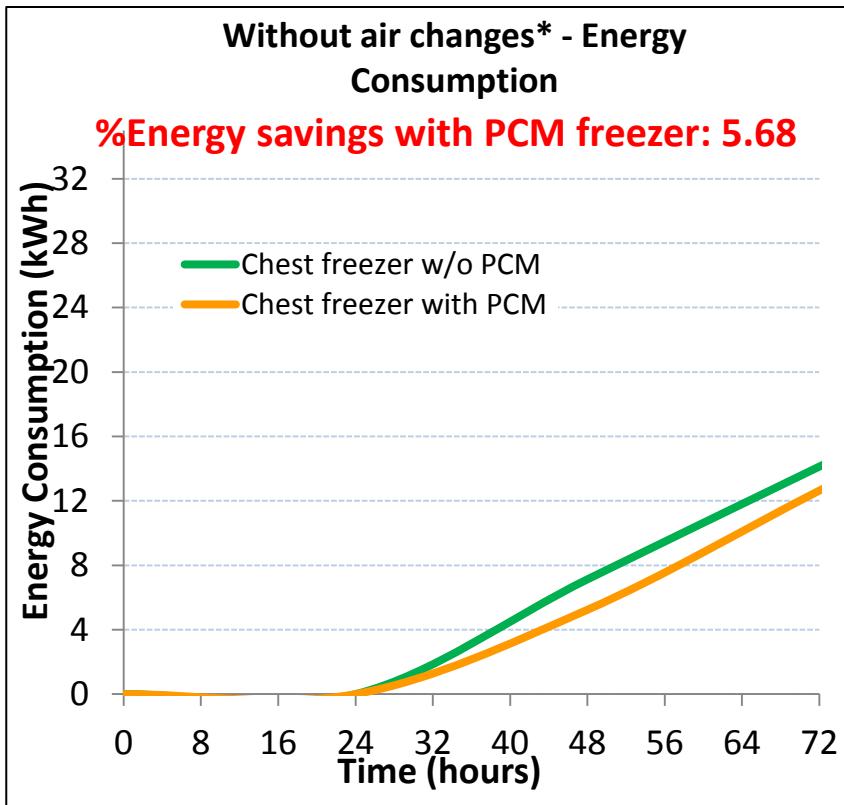
### 3.2 Temperature retention curve of Coolers without Load



**Desired temperature to be maintained inside the cooler is 2 to 8°C**

## 4. TESTING RESULTS OF FREEZERS AT FARE LABS, GURUGRAM

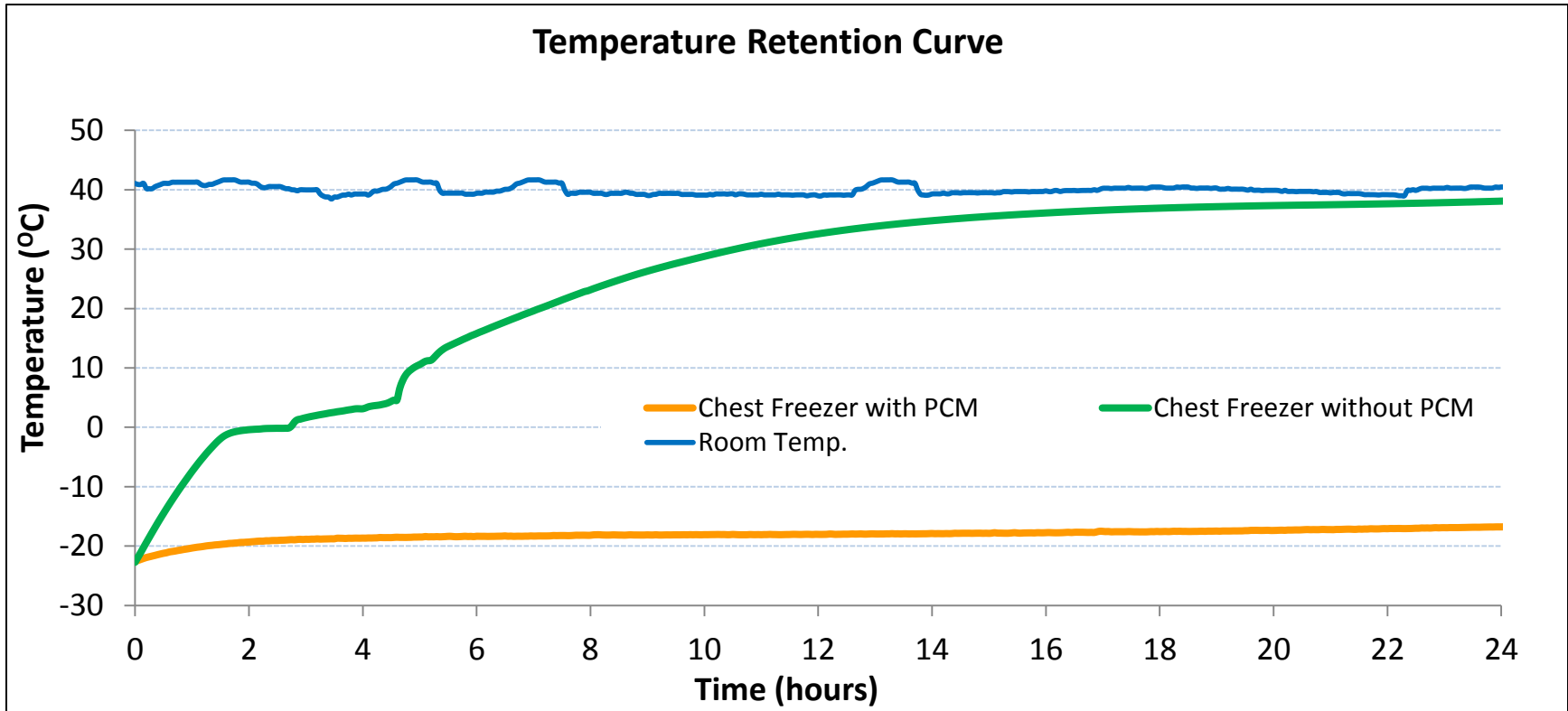
### 4.1 Energy Consumption comparison of Freezers without Load\*



(\*Air Changes : Regular opening and closing of cooler's door/lid)



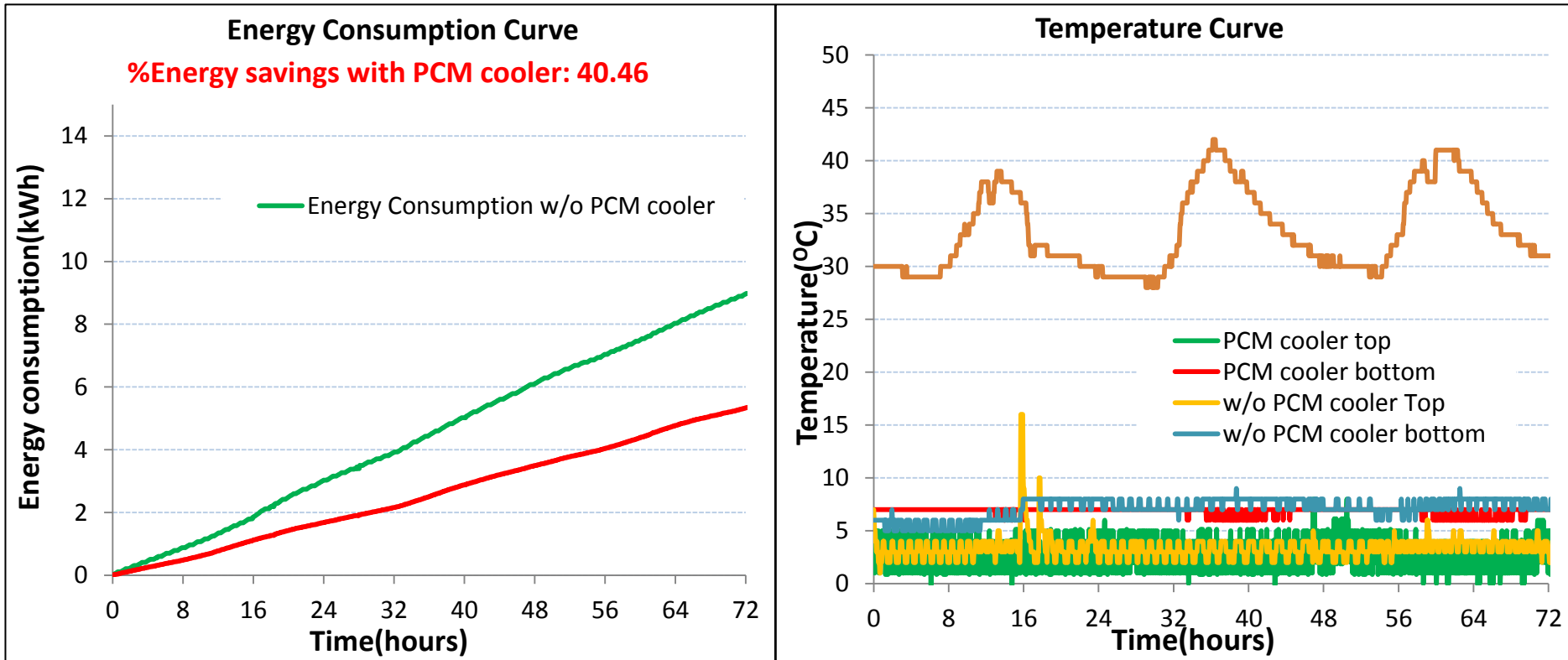
## 4.2 Temperature retention curve of freezers without load



**Desired temperature to be maintained inside the freezer is -18 to -23°C**

## 5. TESTING RESULTS OF COOLERS AT MILKBASKET, GURUGRAM

### 5.1 Energy Consumption of Coolers with load under regular usage



Desired temperature to be maintained inside the cooler is 2 to 8°C

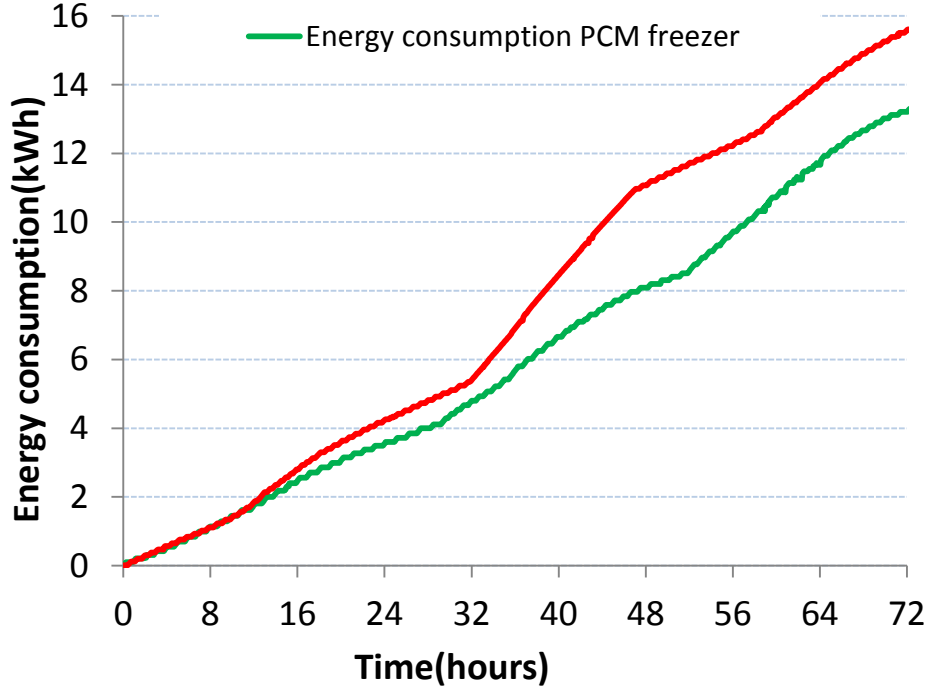
## 6. TESTING RESULTS OF FREEZERS AT MILKBASKET, GURUGRAM

### 6.1 Energy Consumption of Freezers with load under regular usage

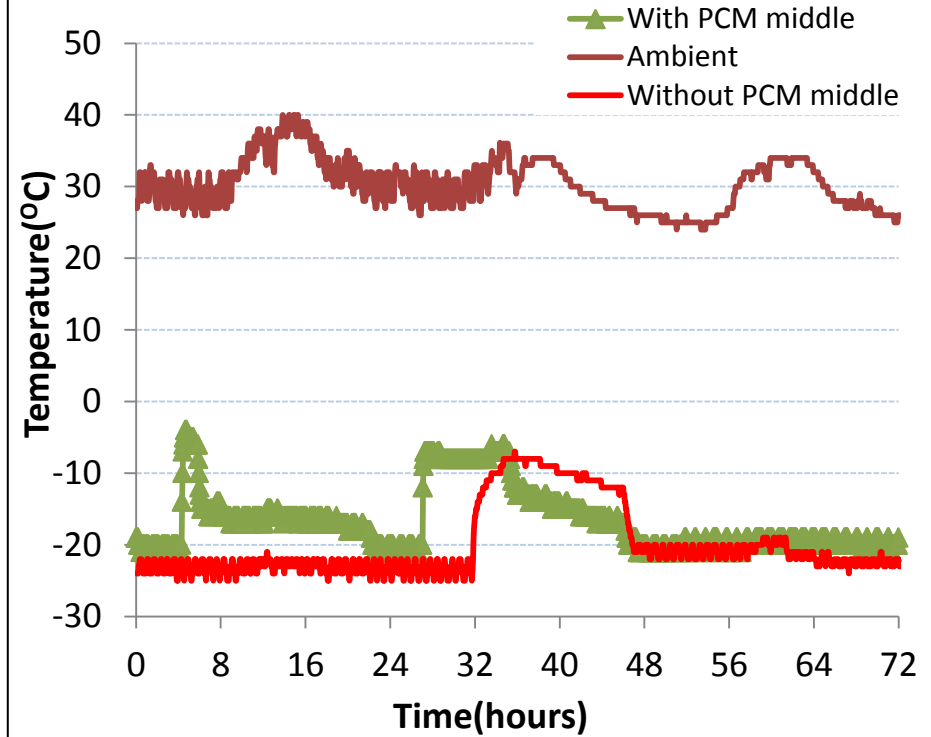
Energy Consumption Curve

**%Energy savings with PCM freezer: 14.76**

— Energy consumption PCM freezer



Temperature Curve



**Desired temperature to be maintained inside the freezer is -18 to -23°C**

THANK YOU