

# Mass Effekt Solutions

*Passive thermal management systems for Buildings*

# Pluss Advanced Technologies

## **Vision:**

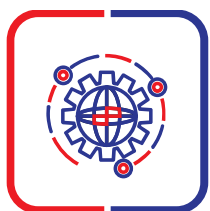
To create impactful innovations.

## **Mission:**

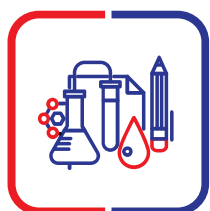
To build value by R&D in polymers and phase change materials.



# Leaders in Thermal Energy Storage



Material  
Science Focus



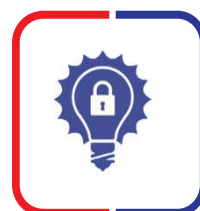
Research and  
Development



Green  
Technology



Product  
Company



Strong  
Intellectual  
Property Rights

**India**

**10**

2 Granted  
8 Pending

**USA**

**4**

3 Granted  
1 Pending

**Africa**

**2**

2 Granted

**Europe**

**2**

1 Granted  
1 Pending

**South East  
Asia**

**1**

1 Granted

**Brazil**

**1**

1 Pending

**20**

Patents  
In various  
geographies



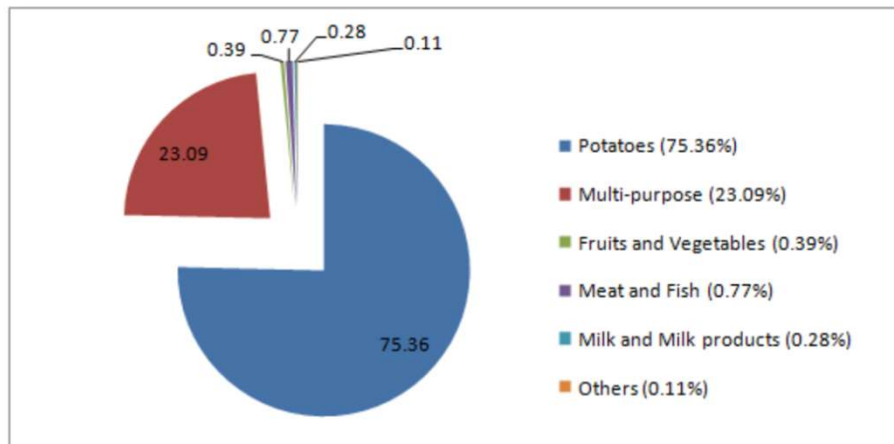
**CEPT**  
UNIVERSITY

# Cold storage Warehouse

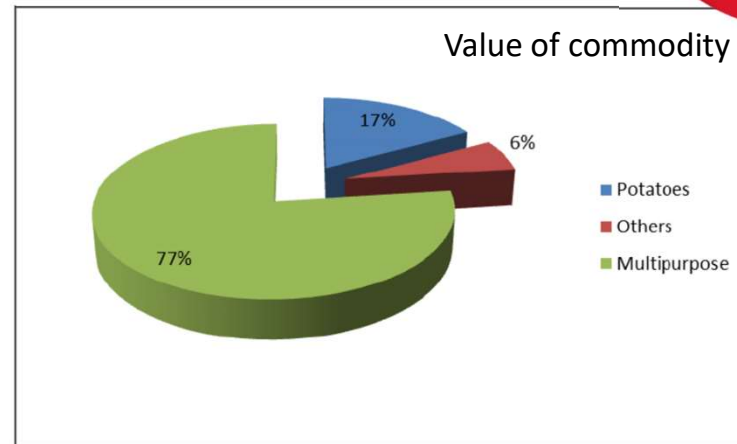
## Current Scenario in India

- India has the largest capacity at 150 million cubic.meter
- **68%** for Potato storage & **32%** for multi commodity

- 7645 units
- 35 million tons
- 150 million cubic.mtr



Source: 2010 Global Capacity Report by International Association of Refrigerated Warehouses



Source: Yes Bank, Cold Chain Opportunities in India, 2016

The multi commodity cold storages cater to meat & poultry, seafood, dairy products, fruits & vegetables and pharmaceuticals.

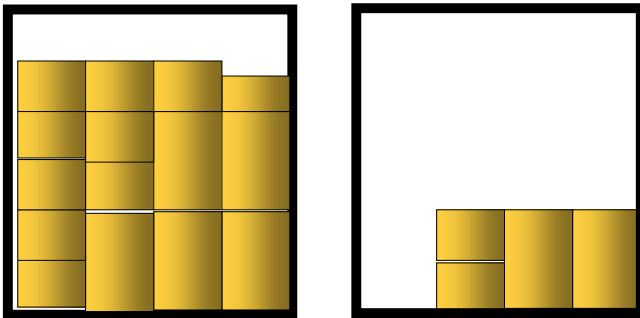
# Cold storage Warehouse

## Current Scenario in India

- **95%** owned by the private sector, **3%** by cooperatives and **2%** by the public sector
- Accounts for **1.2 GW** or 0.5% of the installed electrical capacity
- A majority of **1,251 cold storage owners** are currently **dismantling** the **cooling technology** of the 1970s.
- Avg power earlier was Rs.8 per hour and with new technology has improved to **Rs.4 per hour**.

# Cold storage Warehouse - Challenges

## 1. Part Load Utilization



- Fixed Rental for Space
- Fixed cost of energy
- Poor part load efficiencies of refrigeration systems



- Eroding margins
- Non-competitive prices

## 2. Temperature Non-compliance



- Unexpected spike in heat ingress
- Frequent opening and closing
- Breakdown of system



- Product loss
- Degradation in quality

## Cold storage Warehouse - Challenges

### 3. No Visibility of Temperature and Performance Visibility



- No data to ->measure -> Monitor >- Evaluate
- Unable to respond in time or take preventive action
- Unable to optimize energy and resource utilization



No scope to evaluate inefficiencies

## Challenges

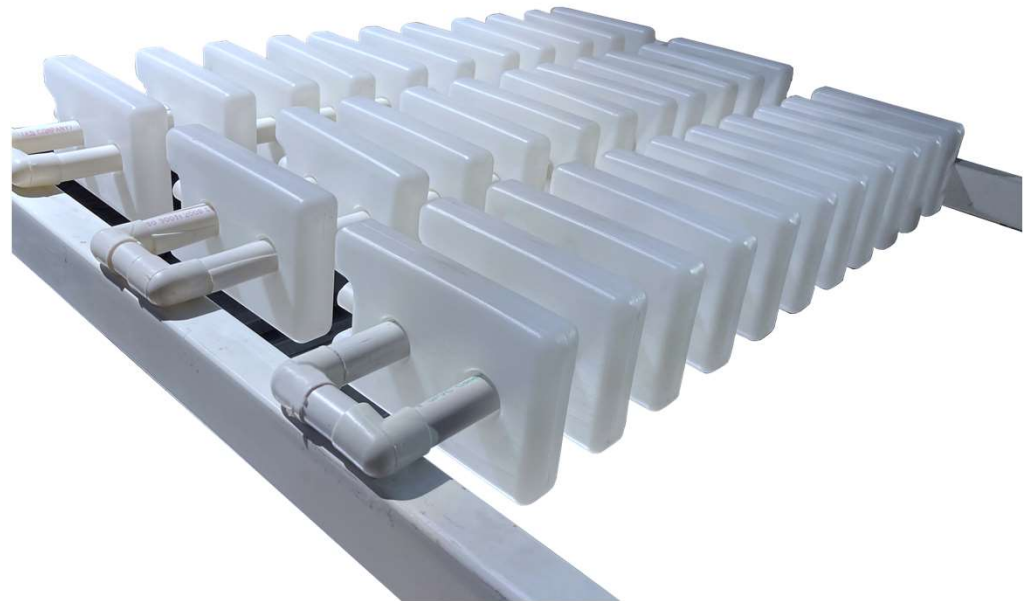
- 1. Part Load Utilization**
- 2. Temperature Non-compliance**
- 3. No Visibility of Temperature and Performance Visibility**

Is there a Simple, Sustainable, cost-effective, high performance solution that can address all these?



## MassEffekt™

- Reduces **Dependency** over **power** source.
- **Thermal Management** to increase efficiency
- **Shifts Peak** power loads to **off-peak** hour
- Reduces **energy** consumption



# MassEffekt™

MassEffekt™ solutions by Pluss Advanced Technologies offers innovation solution for large cold storage warehouses centered around its proprietary phase Change Materials(PCMs)

**Peak Period  
Energy Pricing: 13 Hours**

**Before TES**  
**Peak Period Consumption  
& Peak Demand Charges**  
**50%** of annual energy  
**COST**

**PCM modules absorb**

**↑ UP  
TO 85%**

of heat infiltration for more stable temperatures, better food protection, and lower energy costs.

## Impact

**FREEZER ENERGY  
CONSUMPTION**  
reduced

**32%**



**PEAK PERIOD  
CONSUMPTION**  
reduced

**43%**



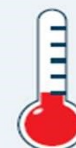
**PEAK PERIOD  
DEMAND**  
reduced

**29%**

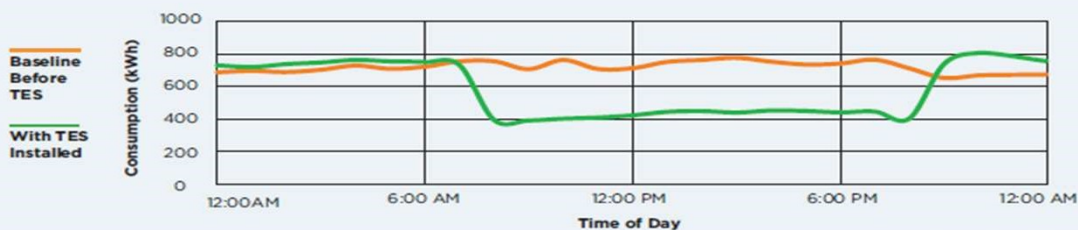


**50%**

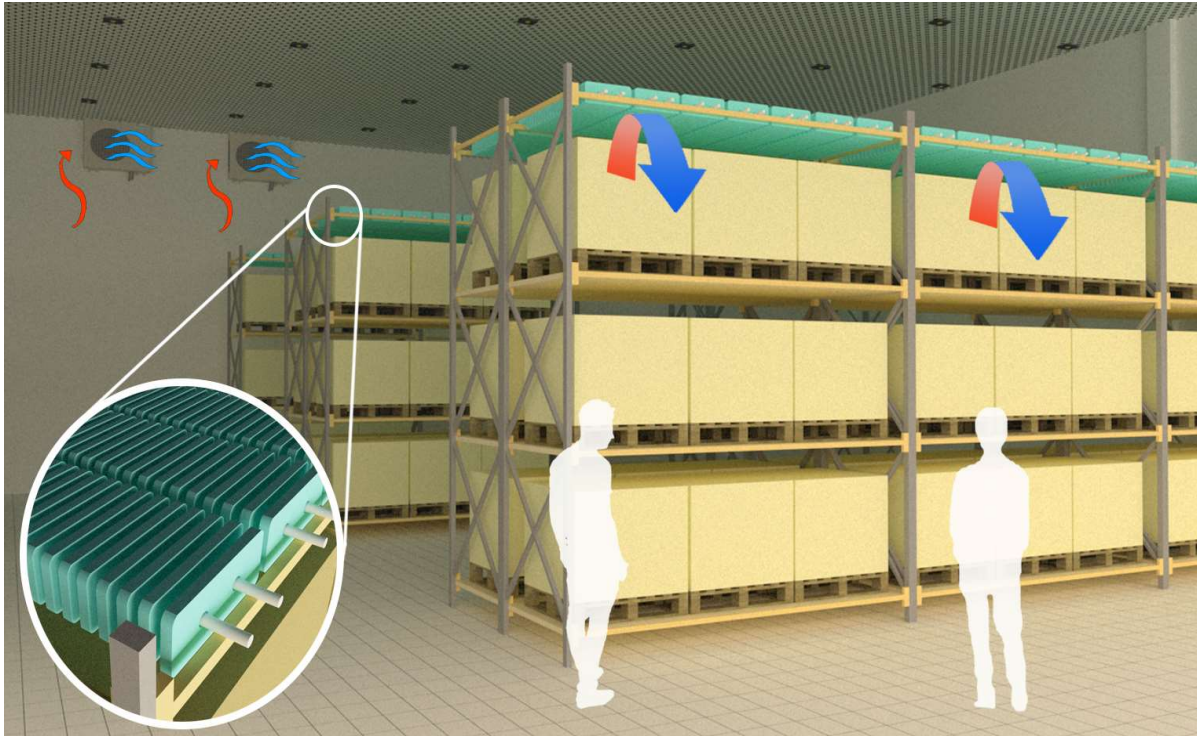
More Stable  
**TEMPERATURES**



## DAILY WEEKDAY CONSUMPTION

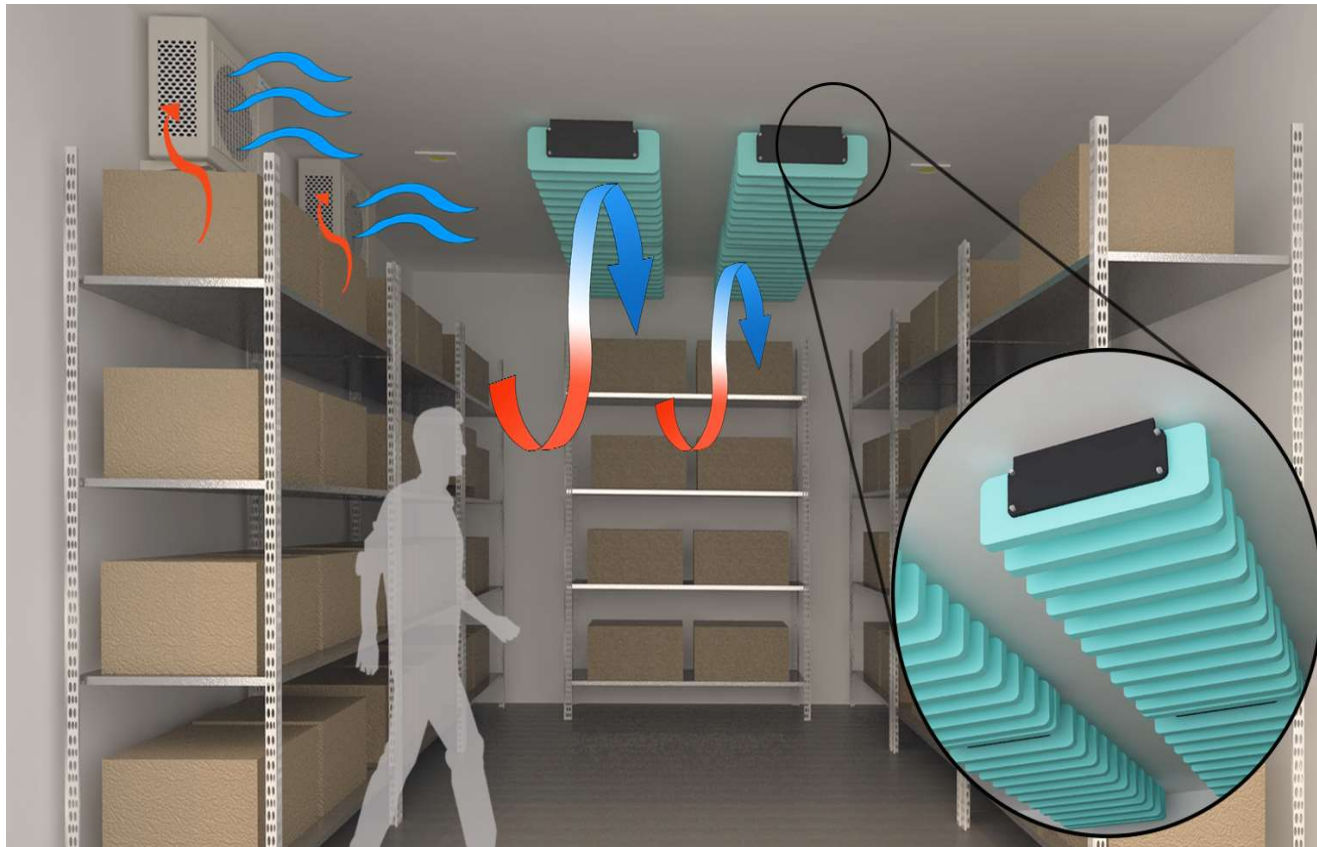


## MassEffekt™ How it works?



- Heat moves upwards by natural convection which is absorbed by PCM modules.
- The PCM modules release stored cold energy that tends to move downwards to the product.
- TES is equipped with enough energy by virtue of its mass to maintain a stable temperature range even without active refrigeration for up to 13 hours.

## MassEffekt™ System Simple and Versatile



- **No Size restriction:** Suitable for both small and large cold warehouses.
- **Rapid Installation:** Turnaround of 5 hours.
- **Retrofittable design:** Modular & easy integration



## MassEffekt™ -The Principal

The **Kw / TR** consumed differs depending on the operating condition of the refrigeration unit.



### Partial load performance

- 1kw/TR at 100% load & 1.25kw/TR at 50% load

### Ambient temperature

- An efficiency gain 2% on a reduction of every 1° C.

### Compressor Cycling

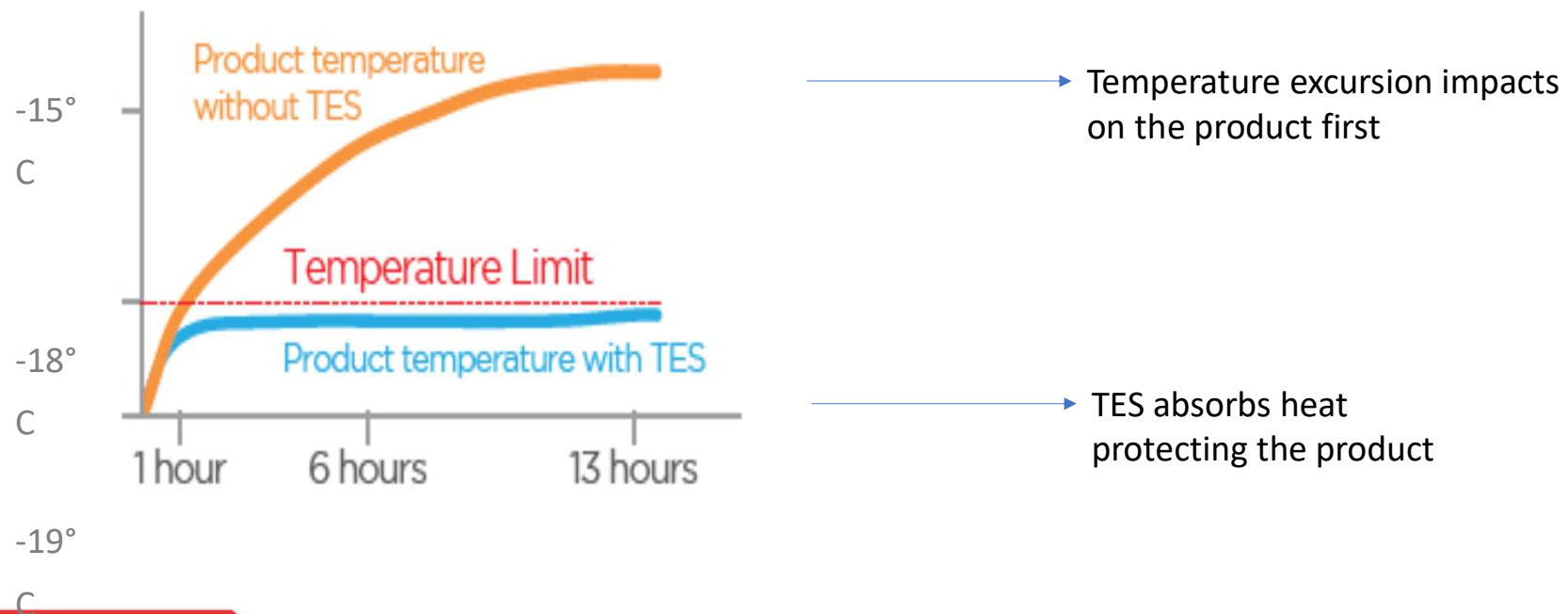
- Frequent cycling vs Less frequent cycling

### Defrost Cycle

- Defrost cycle with TES reduces by upto 50%

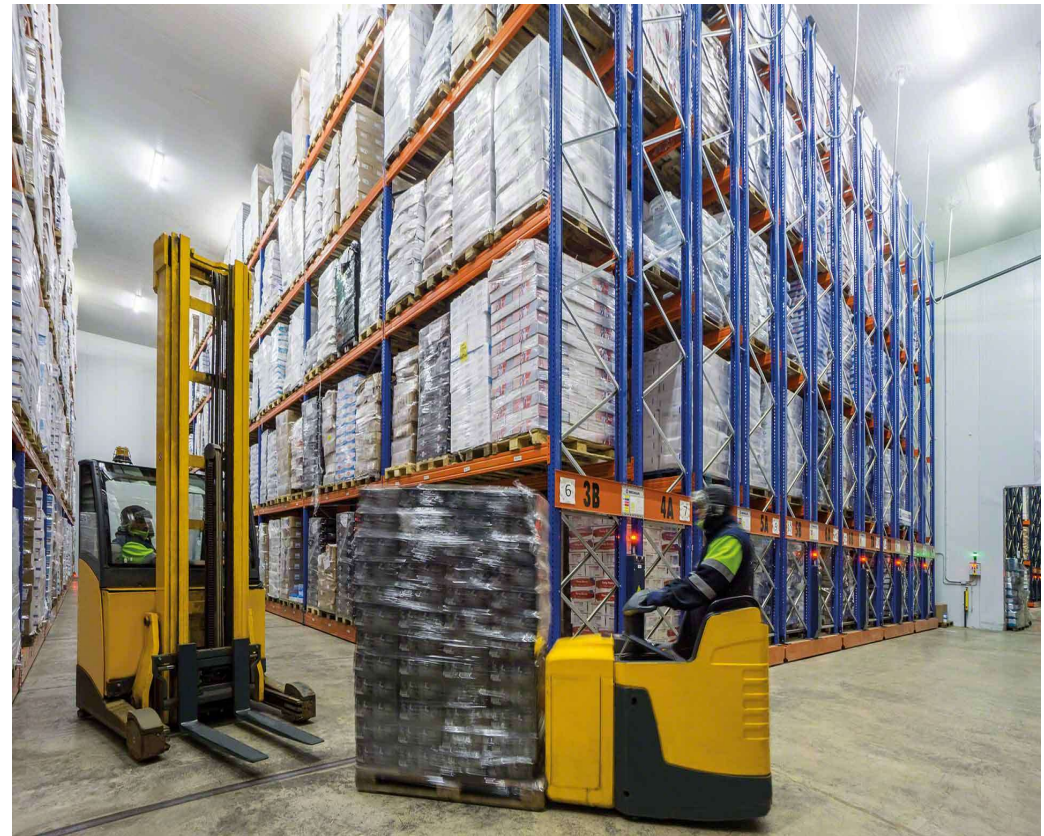
## MassEffekt™ Key Phenomenon - Thermal Inertia

Thermal inertia is a state at which a change in temperature is resisted in a given space.



## MassEffekt™ Value Proposition

- Simple to install, maintain & Operate
- Reliability from power outages and interruptions
- Lower operating cost by 25%
- High ROI - Payback < 3 years
- Custom designed Phase Change Materials



# PLUSS TAINABLE

----- /plʌs'teɪnəb(ə)l/ -----

able to maintain the optimal rate  
or level to meet the needs of the present  
without compromising the needs of future  
generations, **the PLUSS way.**