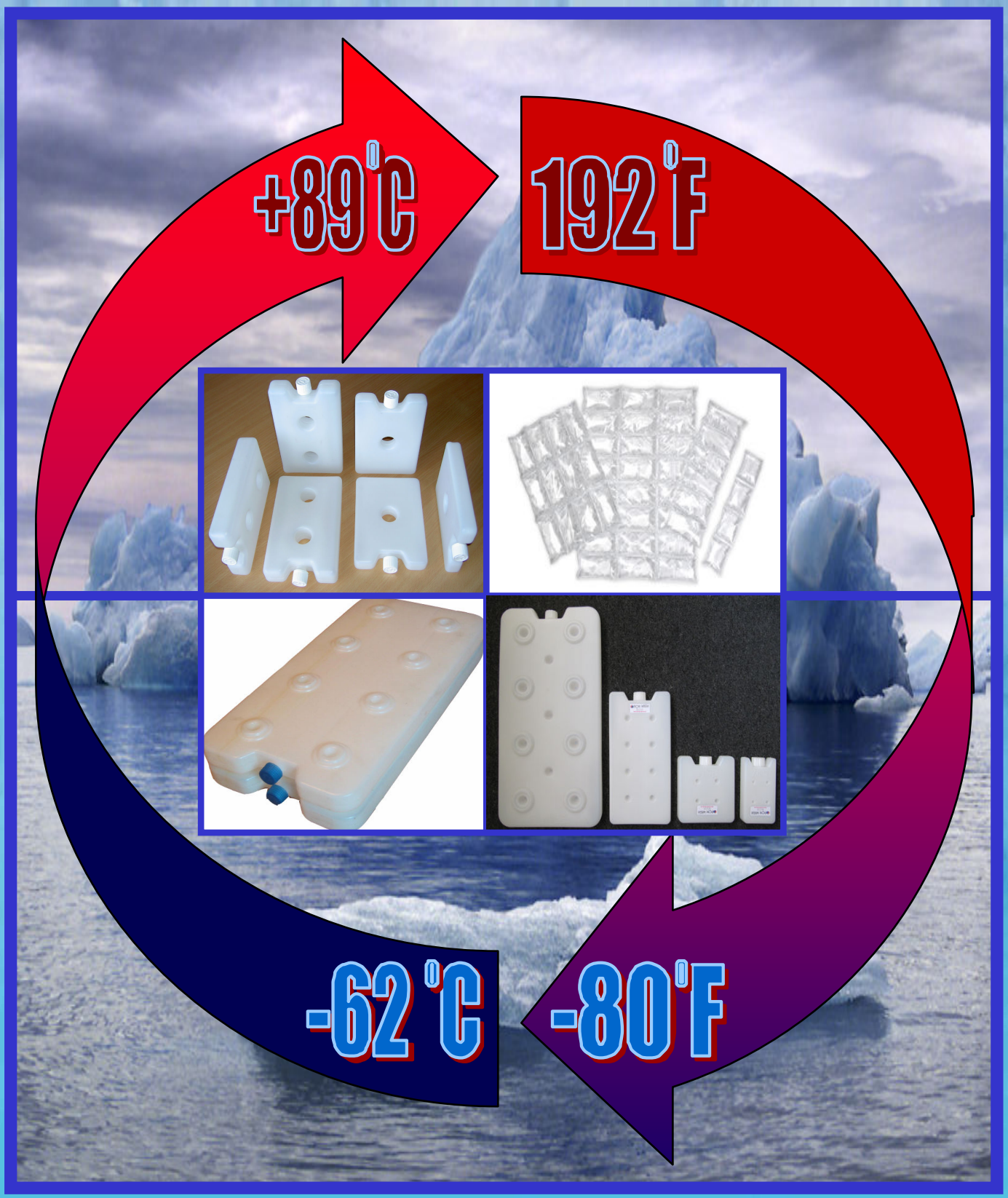
PlusICE™
ICE PACKS & POUCHES



PCM PHASE CHANGE MATERIAL PRODUCTS LIMITED

WORLD LEADER IN TEMPERATURE CONTROLLED PACKAGING

INTRODUCTION;

PlusICE Phase Change Material (PCM) are non-toxic and environmentally friendly chemical solutions with operational temperature ranges between **-100 ºC (-80 ºF)** and **+885 ºC (1,625 ºF).** They can be either supplied as a solution which can be used to fill client's containers or using our standard range of ice packs & pouches.

In addition to our technical expertise, we offer (under the **PlusICE™** branding) what we believe to be the most comprehensive range of PCM solutions currently available commercially.

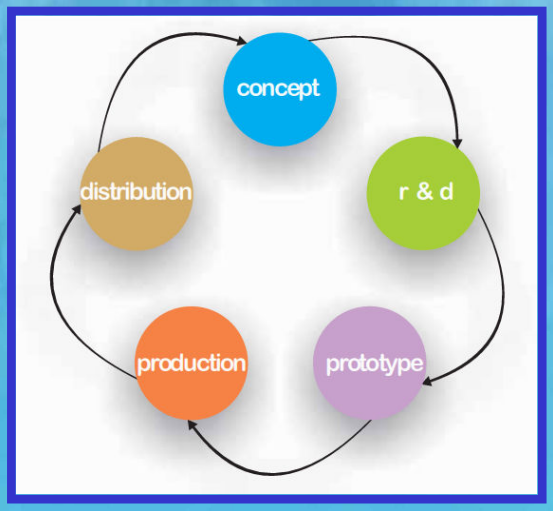
Phase Change Materials, commonly referred to as PCMs, are products that store and release thermal energy during the processes of melting and freezing. Phase Change Materials release large amounts of energy upon freezing in the form of latent heat but absorb equal amounts of energy from the immediate environment upon melting.

This enables thermal energy storage; heat or coolness being stored from one process or period of time and used at a later point in time or transferred to a different location.

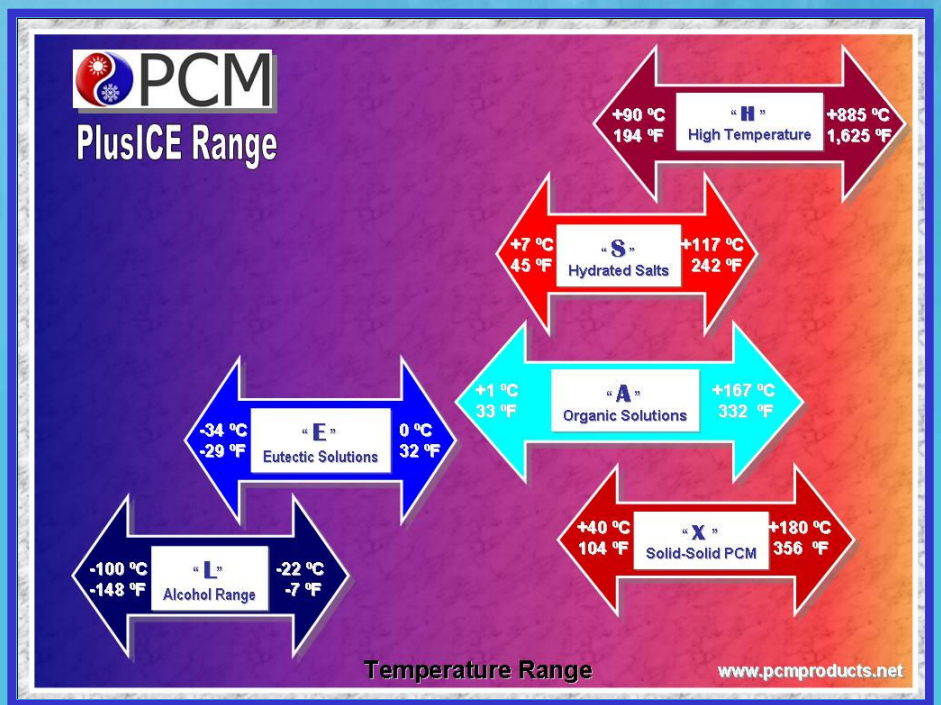
PCMs can also be used to provide thermal barriers or insulation, particularly useful for industry sectors such as temperature-controlled transport.

Interestingly, the simplest, cheapest and most effective Phase Change Material is water/ice. Unfortunately, its freezing point of 0 C (+32 F) precludes it from the majority of energy storage applications. However, a number of alternative Phase Change Materials have been identified and developed that freeze and melt like water/ice, but at temperatures from the cryogenic range to several hundred degrees centigrade.

PlusICE Phase Change Material (PCM) can be either supplied as solution which can be used to fill client's containers or alternatively using our standard range of permanently sealed metallic or non-metallic cells which enable heat transfer via natural convection with surrounding air for any temperature controlled packaging and handling applications.



From initial concept, research and development to production and distribution, our office and manufacturing facility in the UK and our Licensed outlets around the world offer bespoke products to meet unique customer requirements.



WORLD LEADER IN TEMPERATURE CONTROLLED SHIPPING

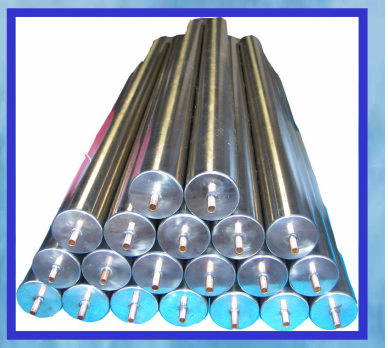
HOW DOES IT WORK;

Eutectic Plates can be reused by means of charging (freezing) and discharging (melting) cycles, over and over again to satisfy static passive cooling and cold storage applications.

Eutectic plates can be placed in insulated containers whereby the shelf-life of the products such as medicines, cooked or raw food, medical items or any perishable item can be extended without any mechanical refrigeration at an affordable investment.

The energy stored by the Phase Change Material is released to keep the surrounding space & product below a pre-set desired temperature.

The heat transfer between the icepack and the surrounding space provides a cooling facility without a mechanical cooling system.



APPLICATIONS;

Eutectic plates can also be manufactured in round shapes to form a passive cooling transport option using a refrigeration pipe to charge the PCM solution for both land and sea based cold storage and transport applications.

* VACCINE TRANSPORT
* ICE CREAM VENDING
* BEVERAGE VENDING
* CHILLED GOODS TRANSPORT
* FROZEN FOOD TRANSPORT
* TRUCK REFRIGERATION
* MARINE REFRIGERATION
* TRANSPORT CONTAINERS
* FRESH PRODUCE TRANSPORT
* MEDICINE STORAGE

***Road Transport*:** A huge percentage of our food is transported with refrigerated vehicles now commonplace. PCM technology can operate without any mechanical refrigeration on board or with mechanical cooling as a back-up cooling option for safe and reliable operation.

Cold Store Back-up: A power failure is potentially extremely costly in food storage. In countries with less reliable power supplies, PCM technology has been employed in warehouses to effectively soak the heat out of the storage area to ensure that the products remain unspoilt.

Shipping: Phase Change Material is now utilised in road, sea/ air freight as a cooling media that provides electricity free cooling solutions up to 72 hours for both frozen and chilled products.

Marine Back-up Cooling: On some vessels, as soon as the engine stops, refrigeration facility does likewise. PCM energy storage allows the temperature to remain under control without power.

Eutectic Plates: Imagine a picnic cooler box, well these plates work in exactly the same way but on a larger scale and for a wide range of cold and hot temperature applications for medical, food and other temperature critical packaging & shipping applications.

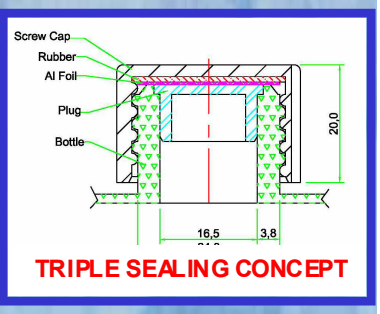
Electric-free Refrigeration & Food Display Packaging: Free cooling or heat-retention - utilised on food salad cabinets and serve-over counters that public transport and the London Underground Pharmaceuticals, medical supplies and blood products are temperature critical.

Pharmaceutical and Medical: PCM solutions are used by military and other health organizations around the world for the packaging and transportation of medicine, blood and tissue.

TEMPERATURE CONTROLLED PACKAGING

ICE PACKS (EUTECTIC PLATES);

Eutectic plates are manufactured using HDPE plastic containers and after filling the containers with PlusICE solution they are sealed using triple sealing mechanism ensuring leak free operation.
Our standard range of ice packs are produced in four sizes to cover wide range of temperature controlled shipping applications.



TRIPLE SEALING CONCEPT

CHILLED PRODUCT APPLICATIONS					
PCM Type	CHILLED				
Type	EXTERNAL DIMENSIONS L (mm)	W (mm)	H (mm)	Weight kg	Capacity Wh
Small	150	80	30	0.37	25
Medium	150	135	30	0.62	43
Large	300	150	30	1.38	98
FlatICE	500	250	32	4.09	288
FROZEN PRODUCT APPLICATIONS					
PCM Type	FROZEN				
Type	EXTERNAL DIMENSIONS L (mm)	W (mm)	H (mm)	Weight kg	Capacity Wh
Small	150	80	30	0.38	22
Medium	150	135	30	0.65	39
Large	300	150	30	1.45	88
FlatICE	500	250	32	4.30	258
+2 ~ +8 C PRODUCT APPLICATIONS					
PCM Type	A4				
Type	EXTERNAL DIMENSIONS L (mm)	W (mm)	H (mm)	Weight kg	Capacity Wh
Small	150	80	30	0.32	15
Medium	150	135	30	0.54	26
Large	300	150	30	1.20	58
FlatICE	500	250	32	3.56	170
+20 ~ +22 C PRODUCT APPLICATIONS					
PCM Type	S20				
Type	EXTERNAL DIMENSIONS L (mm)	W (mm)	H (mm)	Weight kg	Capacity Wh
Small	150	80	30	0.49	22
Medium	150	135	30	0.84	38
Large	300	150	30	1.89	86
FlatICE	500	250	32	5.57	253

APPLICATION;

In principal, the above ice packs can be filled with any of our PlusICE Phase Change Material (PCM) with operational temperature ranges between **-100°C (-80°F)** and **+89°C (192 °F)** for any custom-made applications.
However, the most common applications remain for the chilled and frozen temperature controlled applications.

For non-critical product handling whereby the low cost and less risky products are shipped the standard chilled and frozen ice packs would be an economical option.

However, if the special and / or high value products all the way from expensive wines / food products to tissues, pharmaceutical and other medical products whereby the products must remain between +2 ~ +8 °C (36~46°F) or alternatively within +20 ~ +24 °C (68~75°F) ambient conditions at all times one must not use standard chilled ice packs which might over cool or even freeze the product. Using +4 °C (39°F) or +22 °C (71°F) PCM solutions the risk of overcooling and full temperature stability can be assured.

The same ice packs can be used for maintaining the warm packaging and shipment applications for any food or special product applications using higher temperature PCM solutions.

The above table illustrates the standard sizes, weights and capacities of the most commonly used application range but if required custom-made size and shape of containers can be manufactured to suit any special applications. Of course, good ideas are not the exclusive right of PCM! Many of the non-standard applications are initiated by our customers, whether end-user or developer.
Our technical team is happy to take ideas from conception through to completion including full commercialisation, with or without our production under a Licensee option. Please consult our technical sales team at **sales@pcmproducts.net** for your specific application.

TEMPERATURE CONTROLLED SHIPPING

POUCHES;

Eutectic pouches can be placed in insulated containers whereby the shelf-life of the products such as medicines, cooked or raw food, medical items or any perishable item can be extended without any mechanical refrigeration at an affordable investment.

Eutectic pouches can be reused by means of charging (freezing) and discharging (melting) cycles, over and over again to satisfy air, sea and road transport cooling / heating, personal cooling, medical and cold storage applications.

The energy stored by the Phase Change Material is released to keep the surrounding space / product below a pre-set desired temperature for the design period. The heat transfer between the pouch and the surrounding space provides a cooling facility mechanical cooling system in a reusable, cost effective and environmentally friendly way.

PlusICE POUCHES DESIGN;

PCM Type	Temp. (°C)	Temp. (°F)	Weight kg/m2	Weight lbs/ft2	Capacity kWh	Capacity RTh
A8	8	46	3.2	15	0.194	0.055
A6	6	43	3.2	15	0.195	0.055
A4	4	39	3.1	15	0.198	0.056
A3	3	37	3.1	15	0.196	0.056
A2	2	36	3.1	15	0.196	0.056
E0	*0*	*32*	*4.1*	*20*	*0.378*	*0.107*
E-2	-2	28	4.4	21	0.373	0.106
E-3	-4	25	4.3	21	0.377	0.107
E-4	-4	25	4.3	21	0.340	0.097
E-6	-6	21	4.6	22	0.348	0.099
E-8	-8	18	4.5	22	0.311	0.088
E-10	-10	14	4.7	23	0.371	0.105
E-11	-12	11	4.5	22	0.374	0.106
E-12	-12	10	4.6	22	0.316	0.090
E-14	-15	5	5.0	24	0.338	0.096
E-15	-15	5	4.3	21	0.366	0.104
E-19	-19	-2	5.0	24	0.392	0.111
E-21	-21	-5	5.1	25	0.371	0.106
E-22	-22	-8	4.8	24	0.314	0.089
E-26	-26	-15	5.1	25	0.370	0.105
E-27	-27	-17	4.8	24	0.293	0.083
E-29	-29	-20	4.9	24	0.301	0.085
E-32	-32	-26	5.3	26	0.357	0.101
E-34	-34	-28	4.9	24	0.325	0.092
E-37	-37	-34	5.8	28	0.344	0.098
E-50	-50	-58	5.3	26	0.323	0.092
E-62	-62	-80	5.3	26	0.267	0.076

PlusICE pouches are manufactured using two layers of film (the standard stock material is 300 ~ 500 mm (12") wide) and by forcing these two separate layer into a linear welding rollers, it is initially formed in strips of 50mm (2") side by side along the width of the film (this slot could be increased to max. 100mm (4").

After the welding rollers form the pocket lines, the cavity is filled with the PCM solution and once the pocket slots are filled with PCM, the next stage of the process the horizontal welding blades comes in action and seal the pockets horizontally (hence, the pockets can be arranged in 50mm (2") as standard but longer pockets can be manufactured. Once the liquid is totally seal within each pockets, the last stage of the production cutting blades which come in to action and cutting the blankets to a required length.

PlusICE blankets are manufactured in rolls so that the end users can cut these rolls into whatever the length is required for the application. These blankets can be cut by simply using either a knife or scissors.

CUSTOM-MADE SOLUTIONS;

PCM Products Ltd. offers full system design support to assist in proper selection and integration into existing or new installations as part of our customer commitment.
We offer full consultancy services on new and novel system development on a confidentiality basis with the possibility of Licensee options for local manufacturing. Please consult our technical sales team at **sales@pcmproducts.net** for your specific application or visit our web site **www.pcmproducts.net**

WORLD LEADER IN ENERGY SAVING TECHNOLOGIES

PCM

PHASE CHANGE MATERIAL PRODUCTS LIMITED

Unit 32, Mere View Industrial Estate, Yaxley, Cambridgeshire, PE7 3HS, United Kingdom
Tel: +44-(0)-1733 245511 Fax:+44-(0)-1733 243344
e-mail: info@pcmproducts.net www.pcmproducts.net