



High-performance energy savings that move the world **BEYOND INSULATION™**



bioPCMat™ phase change material

BioPCMats	Unit	25C/77	
		.3 lb/sq. ft.	.56 lb/sq. ft.
Polyfilm thickness	mil	14	14
Weight per square foot	lb	0.51	0.73
Total unit thickness	inches	.25-.35	.4-.6
Material width	inches	16	16
Energy Storage values			
Optimum working range	°F	72-77	72-77
Melt point	°F	75-76	75-76
Latent heat storage capacity	J/g >	170-200**	170-200**
Latent heat storage capacity	BTU/lb	73-86	73-86

*1000 square feet of the .56 lb. bioPCMat will absorb approximately 45,000 BTU's in transitioning from a solid to a liquid.
 **Depends on specific formulation of the product.

The time is now.
 Move **BEYOND INSULATION™**.

To learn more about BioPCMat™ visit PhaseChange.com or call:

800-283-7887

international callers please call

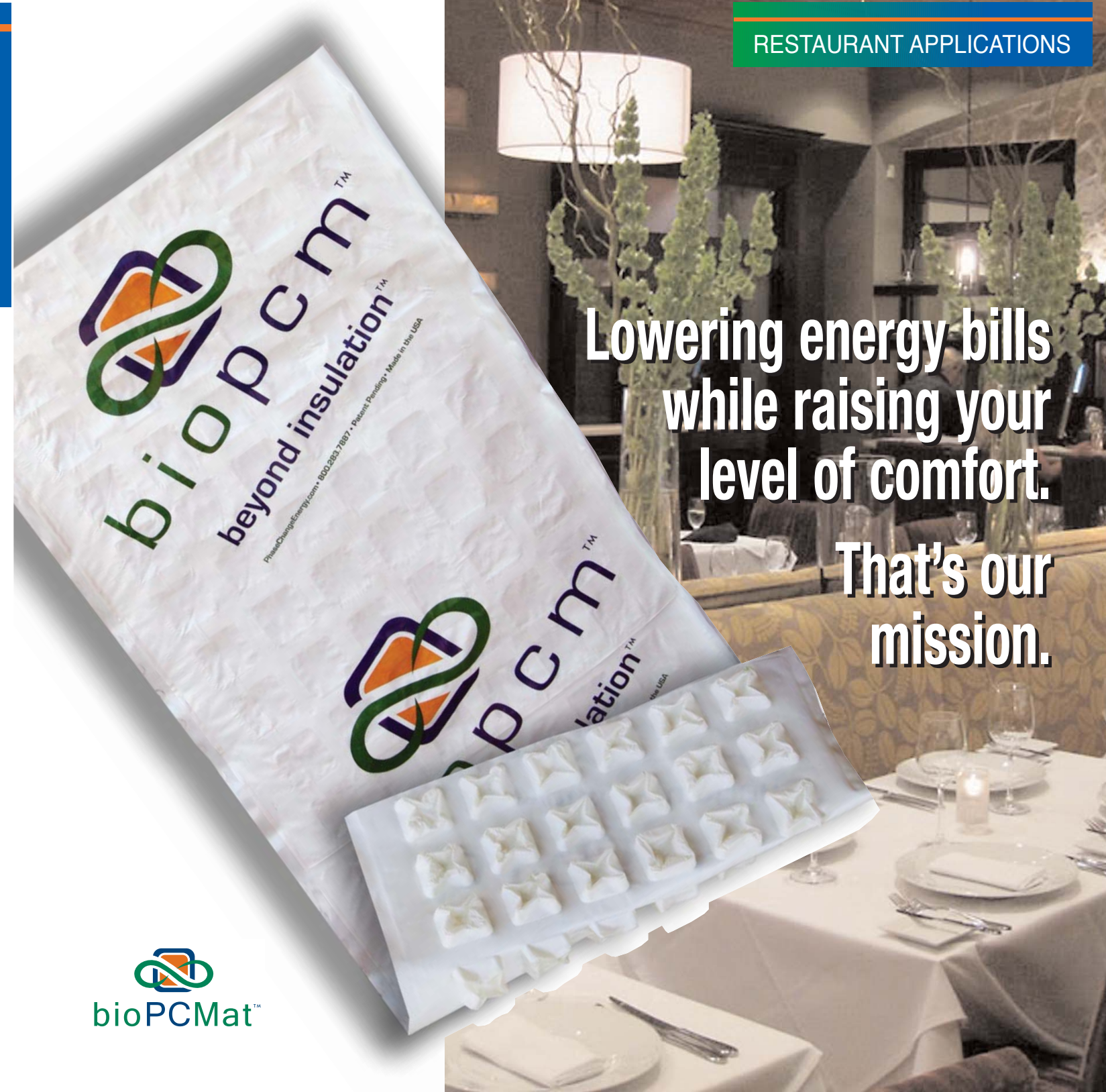
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RESTAURANT APPLICATIONS



Lowering energy bills while raising your level of comfort. That's our mission.



BEYOND INSULATION™

bioPCMat™ uses the power of phase change material to actively absorb and release heat which aids in maintaining constant, comfortable building temperatures.

HOW bioPCMat™ WORKS:

Restaurants use the most common phase change material every day when they put ice in their customer's drinks to keep them cold. As the ice melts it absorbs heat thus keeping the drink cold. Phase Change Energy Solutions' bioPCMat™ utilizes a plant based BioPCM material that freezes and melts in the range of 72 to 77 degrees Fahrenheit. Our product can be installed in a matter of a few hours, by simply laying the mat product over the top of existing drop-in ceiling tiles. As the temperature in the restaurant rises above the melt temp, our bioPCMat phase change material absorbs the heat helping to cool the structure which causes our product to melt. As the temperature drops during the nighttime hours, the product releases the stored heat, warming the building and causing the bioPCMat to refreeze.

Restaurants generate additional heat at lunch time and dinner time as a result of increased usage of ovens, griddles and fryers and having a large number of customers on site. The installation of our BioPCMat product reduces the peak cooling load on air conditioners at this time and also keeps the kitchen area at a much more comfortable temperature. This defers some of the required cooling into the night time when air conditioner units are much more efficient due to a lower outside temperature thus reducing electricity costs. In a cold climate or in the winter, the excess heat generated at peak operating times is "stored" and is given back when less heat is being generated inside of the restaurant. This greatly reduces the total heating bill.

bioPCMat has been installed in many different restaurants in different locations across the United States and Canada. In five separate monitored tests each restaurant saved at least ten percent on their total energy bills, combined electricity and gas, and in each case saw a payback on product installation of less than two years.

THE PRODUCT

Our bioPCMat comes in approximate 4 foot pre-cut lengths for easy installation in ceilings and in approximate 8 foot lengths for installation in walls. Our "25Q" product line is designed at a specific temperature range to achieve excellent energy savings in restaurants and quick service restaurants. Our phase change material is not a petroleum product but rather a bio-based product that has a BEES (Building for Environmental and Economic Sustainability) rating, and is bio-degradable. The product has a fire retardant added and has an ASTM E 84 class C fire rating. The phase change material is packaged in an easy to handle and install, engineered film mat and is "gelled" such that when it melts it remains as a very thick product that won't run if the enclosing film is punctured. The bioPCMat comes with a weighting of .3 pounds of phase change material per square foot, which is recommended for use in the dining area, or with a weighting of .56 pounds of phase change material per square foot recommended for use in the kitchen.

TEST RESULTS

It has always been said that pictures speak louder than words and for some this same concept also works with graphs. The graph to the right, along with some explanation, shows the results of adding phase change to a building. In this case the information comes from two small buildings, built to commercial code using wood framing, R13 insulation in the walls, R 30 insulation in the ceiling, and typical sheet rock interior finishing. The buildings are identical except that one has our bioPCMat product placed between the sheet rock and the insulation in the walls and ceiling and the other does not. In this case neither building has air conditioning or heating. The black line shows the outside temperature which dropped to about 54 degrees F at 6:00 am and rose to 85 degrees F at 4:00 in the afternoon on the day of the test. The red line shows the temperature in the insulated building without phase change material. The temperature dropped during the night to a low of 60 degrees F and then rose in the afternoon to a high temperature of 83 degrees F. In comparison the blue and brown lines show the temperature in the building that had the phase change material (pcm) added in the walls and ceiling. The temperature in the building with pcm stayed between 68 and 73 degrees F during the entire twenty four hour period.

A test was run at the STAR test facility in Arizona. In this case two building were constructed which were identical except one had our bioPCMat product installed in the walls and the ceiling and the other one did not. Over the course of a year, the building with the phase change material consumed 20 percent less energy than the control building without PCM. The full details of this test were summarized in a technical paper written by Arizona State University and which can be found on our website. The graph at the right shows the air conditioning run time for the two buildings on a hot summer day near Phoenix. The air conditioner in the building without the phase change material ran continuously from 2:30 pm until after 7:00 pm (the red graph) and was not able to keep the temperature in the building at the desired temperature. The air conditioner in the building with the pcm turned on an off all through the day and was able to keep the building at the temperature set on the thermostat.

A series of tests were conducted in national brand fast food chains stores ranging from sandwich shops to pizza restaurants. The bioPCMat was placed above the ceiling tiles in these restaurants and the total energy savings of the restaurants as measured by metered electricity and gas use has been consistently greater than 10 percent. The time to payout of the various installations has been consistently less than two years and in areas where electricity costs are higher than the national average, payout has frequently been less than 18 months. This has held true for installations across the United States and up into Northern Canada. Phase Change Energy Solutions offers a product that is environmentally friendly and offers the business owner an excellent return on investment.

INSTALLATION: Ceiling

The bioPCMat comes in pre-cut lengths, slightly less than four feet in length designed to lay on top of drop in ceiling tiles. Installation is done by raising up one ceiling tile and rolling the product out across two adjacent ceiling tiles. Phase

change material is thermal mass and unlike insulation, doesn't need to be everywhere to be effective. You need enough pounds of the phase change material installed with sufficient surface area for effective heat transfer to take place for an optimum result. We recommend placing one four foot long by 16 inch wide mat strip over two of the standard 2' X 2' ceiling tiles. This is two thirds coverage of the actual physical space. Also, material is not placed on a tile that has a light fixture or a HVAC vent. Thus for a restaurant with a floor space of 3000 square feet, about 1500 square feet of product would typically be placed in the actual ceiling. It is recommended that the .56 pound per square foot bioPCMat be placed in the ceiling over the kitchen, serving area and entrances where the heat load is highest and that the .3 pound per square foot material be placed over the dining area.

Installation can typically be done within a few hours at night when the restaurant is closed such that business is not interrupted. Installation equipment required consists of a step ladder to reach the ceiling and a pair of scissors to cut the mat product where necessary to avoid a light fixture or other obstacle. A more detailed installation video is available on the Phase Change Energy Solutions webpage, www.phasechange.com.

INSTALLATION: Walls

The bioPCMat comes in pre-cut lengths, slightly less than eight feet in length designed for placement in walls. Installation is done by attaching the mat to the studs on the interior wall before installing sheet rock or other interior finishing material. Because the material goes behind the interior wall it must be installed during initial construction or as part of a major remodeling project. It is recommended that the .3 pound per square foot material be used in all of the walls



except for those in the kitchen area where the use of .56 will improve the overall energy savings. Again it is not necessary to have the phase change material every place so odd shaped or narrow areas can simply be skipped during the installation process. Also the mat's design of placing the BioPCM product in small sealed cubes makes it easy to cut around electrical or other outlet boxes in the wall. More detailed installation information on wall applications can be found on our website at www.phasechange.com.

ORDERING bioPCMat

bioPCMat is packed with eight of the approximately four foot long ceiling strips or four of the approximately eight foot long wall strips in an individual package. Thus each package contains 42 square feet of product. Price per square foot and per package of the .3 pound and the .56 pound materials (FOB our factory in Asheboro, North Carolina) is shown on the current price sheet.

For the typical ceiling installation, take the floor area of the restaurant, divide that number in half, and then divide by forty-two and round down to the nearest whole number and that will give you the estimated number of packages of bioPCMat to order. Use an approximate percentage of kitchen and serving space to dining space, such as 35 percent and 65 percent and then use that to determine the number of .56 pound per square foot and .3 pound per square foot packages to order. When installing in walls, exclude the large panels of windows and doors and then assume seventy percent coverage of the remaining wall area for a typical installation. If the walls are 9 or 10 feet high, we would recommend using an 8 foot height in calculating the surface area, as it is not necessary to cut the material to fill in the additional one or two feet of space. bioPCMat is thermal mass and it doesn't require full coverage like insulation to be highly effective. Take the total number of square feet of material desired and divide by 42 for the .56 lb/sq.ft. product and by 52 for the .3 lb/sq.ft., to determine the number of packages of material to order.

