

## What is mPCM?

mPCM are Phase Change Materials that are contained inside a durable microcapsule. PCM, are substances that can change their physical state because of external forces such as temperature. The best known PCM is water. When the temperature rises above a preset level, the PCM turns from a solid to a liquid state. When the temperature drops below a preset level, the PCM reverts from a liquid back to a solid state. This process will repeat as long as the temperature crosses the preset level.

PCM technology was originally developed in the 60's for use in NASA space suits. With the successful introduction of micro-encapsulated PCM (mPCM), this technology became available to the consumer and industrial markets. Comfortemp® nonwovens contain millions of these mPCM as is shown in the enlarged photo on the right. These mPCM are too small for the human eye to see. One mPCM is more than 100 times smaller than a snow flake.

## How does the mPCM technology work?

As is explained above, the PCM inside the microcapsule changes physical state because of a rise or drop in the temperature. In the world of apparel, shoes and accessories, this change in the temperature can also be caused by the initiation of intense physical activity which will increase body heat.

When the temperature rises above a preset temperature, the PCM automatically absorbs and stores the excess heat from the body, causing a cooling effect. This process turns the PCM from a solid state to a liquid one. When the outside temperature drops below a preset temperature, the PCM automatically releases the stored heat back to the body, causing a warming effect. This process turns the liquid PCM back to a solid state.

Because the PCM inside the microcapsules responds automatically to changes in the temperature, the body will remain in a comfortable temperature range longer. With the mPCM technology, you stay warmer when it is cold and cooler when it is hot..

Comfortemp® Advantages

### Dynamic and Dual Protection

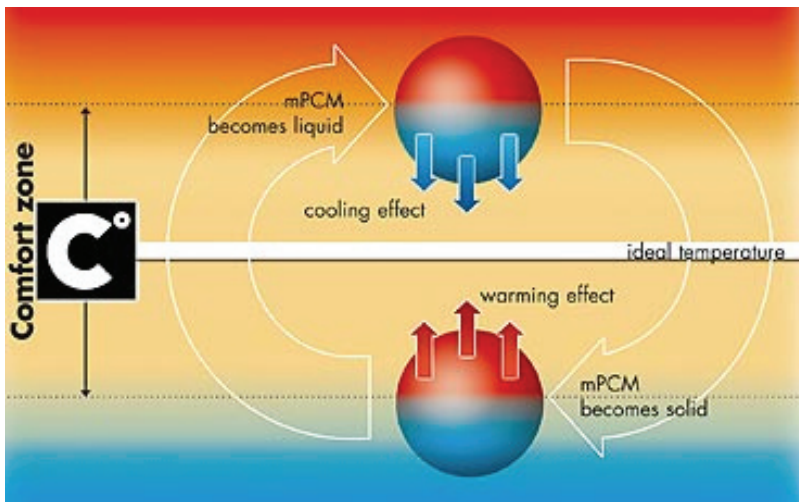
Traditional insulation materials or moisture management materials keep you either warm OR cool, and NOT both. With its mPCM, Comfortemp® offers automatic dual protection in one material. When you need warmth, Comfortemp® provides it. And when you start getting hot, Comfortemp® provides you relief and comfort by absorbing the excess heat so you sweat less. Comfortemp® is extremely breathable which makes it very suitable for applications in apparel, shoes, accessories and bedding. Comfortemp® also has a soft feel and is therefore easy to handle. Comfortemp® nonwovens can contain varying amounts of mPCM, depending on the application and the individual requirements. In any case, Comfortemp nonwovens will always remain pleasantly soft and have a textile handle.

A typical shopping situation:

Into the heated store, back onto the street. The bags are heavy and the sweat pours down... Without Comfortemp® you experience the full temperature portfolio, whether you like it or not - at times too hot, then again too cold.

With Comfortemp® however, you move in the comfort zone, as all temperature changes will be balanced without you even noticing it. You feel comfortably warm longer, even when it is cold, and comfortably cool, even when it is hot.

Traditional loft insulation protects the wearer against the cold by trapping air within its fiber structure. We call this type of insulation “static” because it provides to the wearer constant protection against the cold regardless of the environment of the wearer. Comfortemp® provides what we call “dynamic” protection to the wearer because the mPCM react automatically to the changing external temperature of the wearer, absorbing heat or releasing the stored heat as needed. As a result, Comfortemp® allows the wearer to stay cool when it is hot and stay warm when it is cold.



### How long do mPCM keep absorbing heat in “hot” environments? How long to mPCM keep releasing heat in “cold” environments?

In general, mPCM do not have an infinite capacity to keep absorbing heat or at the other end of the spectrum to keep discharging heat. In real life situations, however, the external environment of the mPCM changes over time and across physical activities so that mPCM are able to “recharge” and keep performing for even longer periods of time. For example, when the wearer of a suit containing Comfortemp® is outside in the cold waiting for a train, the mPCM are releasing the previously stored heat. When he or she boards a crowded warm train, the mPCM are absorbing heat and “recharging” so that when the wearer steps into the cold again, the mPCM are ready to release the stored heat again.

### What is the difference between moisture management fabrics and Comfortemp®?

Comfortemp® starts working earlier than moisture transporting materials. If you sweat a lot you should wear materials on the skin to transport moisture away from the skin to the outside. Comfortemp® ensures that the body heat will be absorbed by the mPCM before sweat is produced. This creates a pleasant cooling effect long before the skin becomes moist.

In many situations, however, the wearer needs both warmth and coolness in the same garment. A skier, for example, needs warmth from their garment when he/she is waiting for the chairlift, and needs coolness from the same garment when he/she enters a warm lodge after skiing down the hill. Unlike moisture management fabrics, Comfortemp® does provide this “two-way” comfort in one material through mPCM technology, thereby allowing the wearer to stay cool when it is hot and stay warm when it is cold.

### C° and Feel the Difference –

Total comfort whatever you do, wherever you are, and whatever you wear. Apparel with Comfortemp® is soft on your skin, functional in outdoor sports fashion, protective and comfortable in workwear.

Comfortemp® is the brand name for intelligent nonwovens, into which mPCM materials have been integrated. They interactively react to changing body or outside temperatures.

Depending on the individual situation or activity level they absorb excess body heat and store it until it is needed again. This keeps you in the comfort zone longer.

With Comfortemp® in your garment, shoes, gloves, hats and blankets, you can stay warmer when it is cold and cooler when it is hot. With Comfortemp®, you will C° and feel the difference.

