

What is Heat Transfer and How It Can Affect Packaging Materials.

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Who is this document for?

Packaging engineers,
Purchasing/procurement,
R&D
Strategic sourcing,
Anyone wanting to learn more about cold chain packaging, insulation, and heat transfer.

What is the goal of this document?

The goal of this one-pager is to educate.

More specifically, it's intended to help guide and drive the conversations around procurement initiatives for eco-friendly thermal insulated packaging solutions.

Of course, there are PhD dissertations on the subject matter. But, at ColdShip we believe a well-informed customer makes the best decisions for their firm. So we condensed years worth of research in one simple page.


We help plant the seed in the customer's mind so that you get the best ROI for your time and money.

Key Takeaway:


Heat transfer comes from many sources. As packaging enthusiast(s) you should consider the carrier modes and carrier types for your final mile deliveries.

Be sure to ask your packaging suppliers about the weight of freezing agents, the thickness of the insulation walls, and overall dimensional weight, these directly impact your downstream shipping costs.

What is heat transfer and insulation?


 When thermal energy is transported, it is called heat. In its simplest form, heat transfer deals with the rate of heat transfer between different materials. The following are materials that conduct thermal energy.

- 1) Solids (plastic, wood, ice, concrete, etc.)
- 2) Liquids (water, mercury, ammonia, etc.)
- 3) Gases (air (dry), water vapor, hydrogen etc.)


 ColdShip makes packaging from solid materials, so we will focus on the solid nature of the box liners. Since our thermal box liners are the ones hard at work insulating (protecting contents from heat), we will define conduction, convection, and radiation since that is how heat is transported.

 • **Conduction Heat Transfer:** It is the process where the fast-moving particles in an object transfer their rapid movements to other nearby particles through collisions.

o Conduction heat transfer happens when you touch a hot plate. Similarly, conduction also happens when you grab chocolate candy with your bare hands and the chocolate begins to melt, heat is conducted from your hand to the chocolate.

 • **Convection Heat Transfer:** It is energy transfer by fluid motion. It is the process where something that has thermal energy carries energy to a new location.

o Convection heat transfer happens you are boiling water that is heated at the bottom of the pot and the water boils and rises to the top. Convection also explains why ice melts if left at room temperature. Ice can melt when heat moves to the ice from the air (when you are not touching the ice).

 • **Radiation Heat Transfer:** It is the heat transfer through light.
o Examples include UV light from the sun, heat from a campfire, heat from a lightbulb, etc.

For more information on heat transfer, conduction, convection, and radiation please check out [MIT](#) and [CalTech](#) online resources. (active links provided in this document)