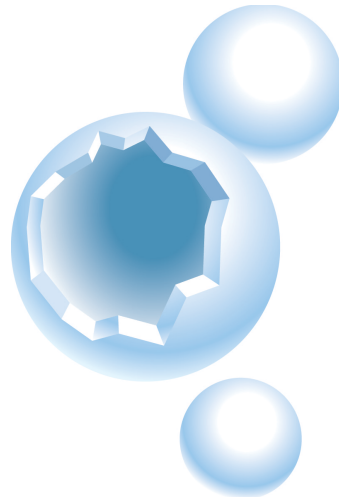


Thermosphere

Glass Microspheres



Heat Transfer Types;



Conduction - Conduction is the transfer of heat through a solid object. When one part of an object is heated, the molecules within it begin to move faster and more vigorously, when these molecules hit other molecules within the object they cause heat to be transferred through the entire object.



Convection - Convection is the transfer of heat by the movement of a fluid (water, air, etc.) Inside of a wall cavity, air removes heat from a warm interior wall, then circulates to the colder exterior wall where it loses the heat.

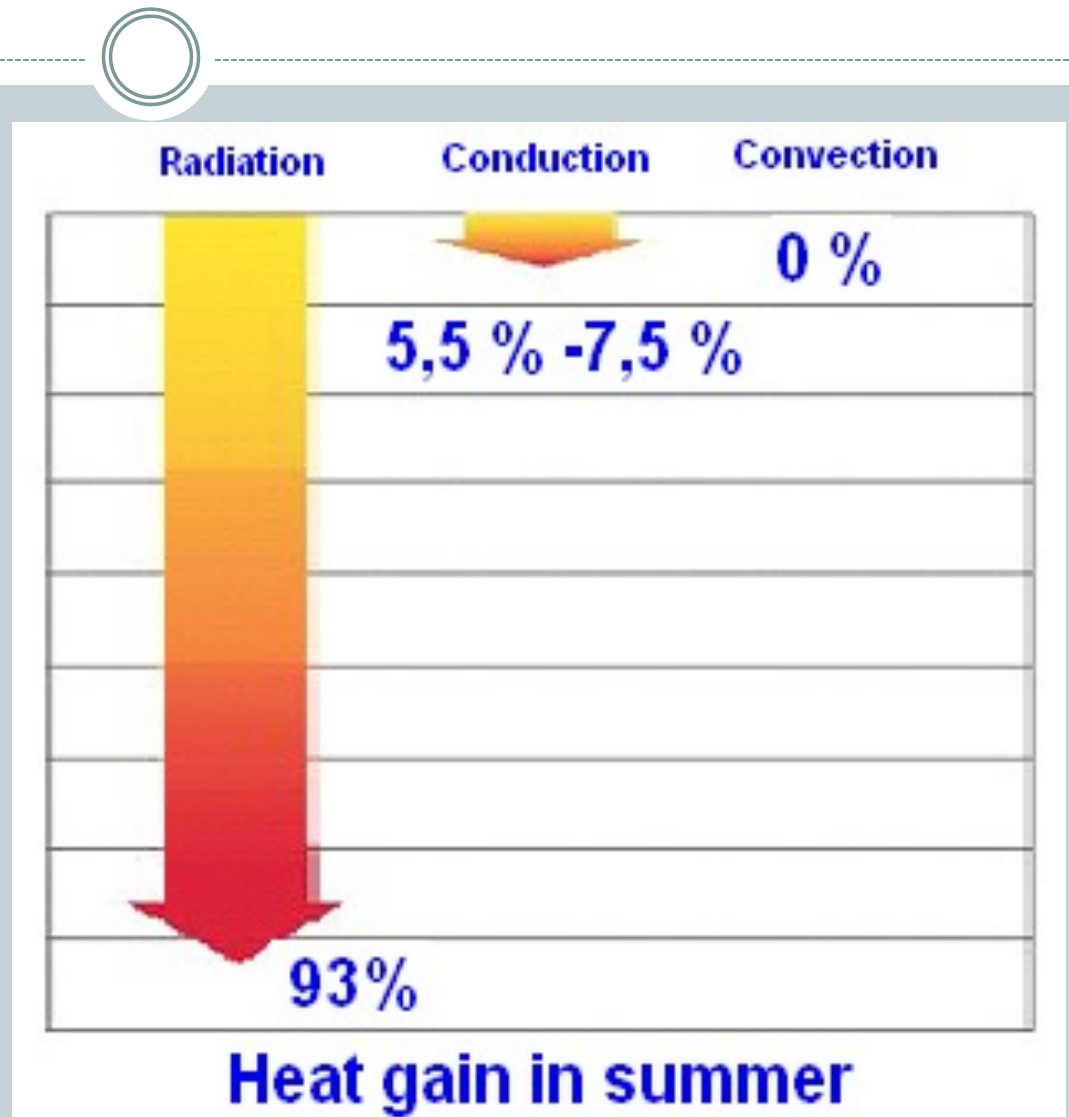


Radiation - Any object will radiate heat to cooler objects around it by giving off "heat waves". This is a direct transfer of heat from one object to another, without heating the air in between. This is the same process in which the Earth receives heat from the Sun or a heater stove supplies heat to its surroundings. We have commonly used (mass) insulation such as Fiberglass, Cellulose, Styrofoam, etc. to slow down and resist R and U value, the heat transfer by way of **conduction only**; they do nothing for the heat transfer by way of radiation.

Heat loss amounts according to heat transfer types

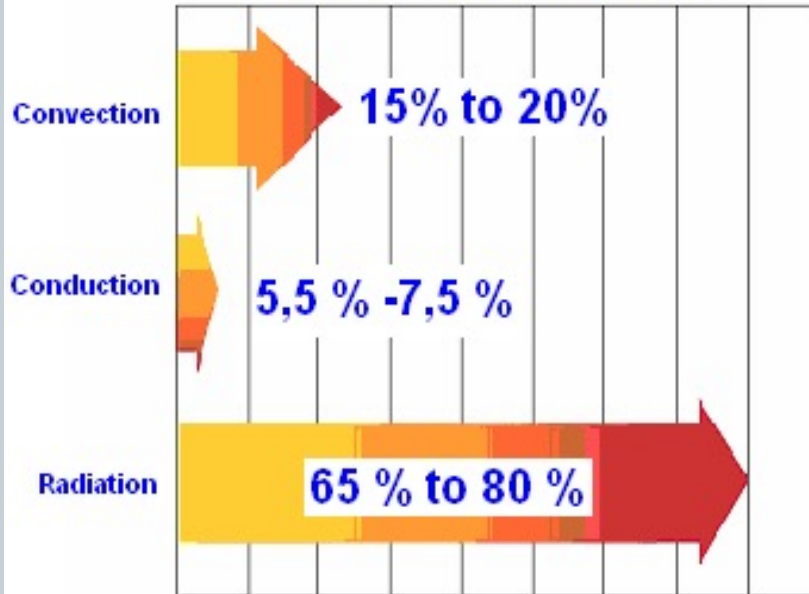
Conduction heat transfer is between 5 % to 8 % of the total heat transfer into and out of a building.

That leaves between 92 % and 95 % of the total heat transfer to be dealt with, mostly by your air conditioner and heater.

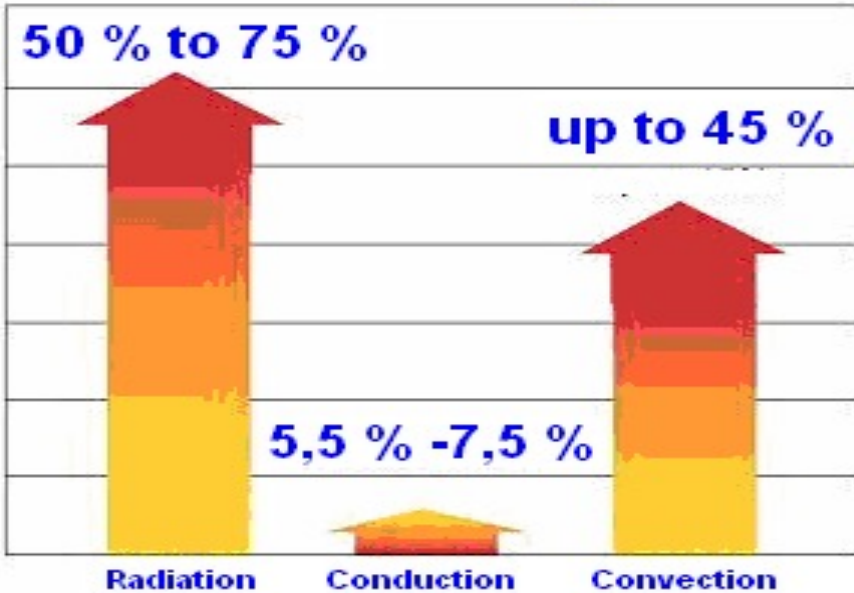


Heat loss amounts according to heat transfer types

Heat loss from walls



Heat loss from ceiling and roof



- ✓ In the wintertime your interior walls and ceilings actually absorb a great deal of the heat that you generate with your heating system.
- ✓ This absorbed heat then flows outward through the walls and ceilings of your home into the colder outside air.
- ✓ This results in an Increased heat requirement and thus gives you higher heating bills.
- ✓ In Summer the heat gain increases interior temperatures and requires extended air-conditioning running times thus gives you higher cooling bills!

How does Thermospheres help to insulate?

1-) Thermospheres reflects and refracts Radian Lights

They reflect and refract Radian Light (Solar Radiation) by more then 85 % by their special Metal alloys present in their special structure. By means of sphere surface technology, Thermospheres has much more surface area to reflect the infrared wavelengths



How does Thermospheres help to insulate?



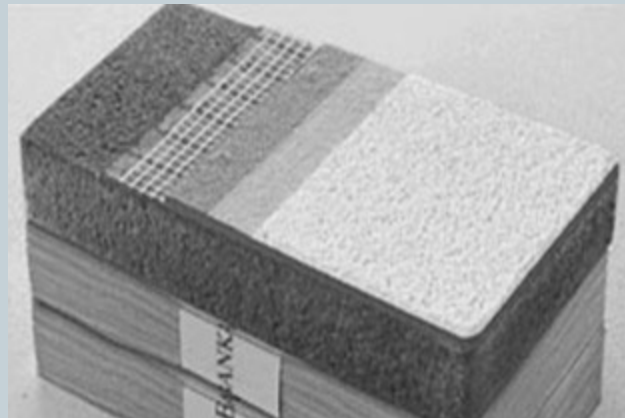
2-) Thermospheres reduce the conductive type of energy transfer by it's low k value.

Thermospheres have very low k value (0.040 W/m² °K) which help to reduce heat transfer in significant amounts.

Thermal Insulation k value of EPS, XPS or smillar : 0.03-0.04 w/m*K

Thermal Insulation k value of EPS, XPS coated with standard coatings: 0.06-0.08 w/m*K

Thermal Insulation k value of EPS, XPS coated with Thermosphere including coatings : 0.04-0.06 w/m*K



Benefits of using Thermospheres Glass microspheres in paints and coatings formulations on the surfaces



- ✓ **Reflect & refract infrared light by more than 85 %**
- ✓ **Reflect Ultraviolet light by more than 85 % which greatly help to duration of coatings**
- ✓ **Reduces conductive heat transfer by their low k value(0.04)**
- ✓ **They don't pick up the dirt, absorb water like the other pigments and coatings used in paints & coating formulations. After the exposure of paint films to the sun light for a time period, the most of the binders used lose their pigment binding abilities by UV light, then pigments and extenders start to appear on the film surface which cause to reduce many properties**
- ✓ **They reduce paint and coating density which help to painters to carry much more less weights in the paint containers and reduce also dry weight of paint film on to surface to create much more strong adherence**
- ✓ **They increase paint & coatings mechanical properties like scratch , impact etc.**
- ✓ **They improve fire retardant property of paints & coatings film**

Comparison of Glass Microspheres with the other reflective additives in paints & coatings.



- Titanium dioxides used in paints formulations have also very high reflectivity in the beginning of their life on the surface, but their reflectivity value go down to 40 % in a very short time by both chalking and dirt pick up problems. It is necessary to formulate titanium dioxide based reflective coating with very high durability type binders which are extremely expensive binders.
- Aluminum Metal pigments has a very high reflectivity value, but paints & coatings are not white anymore. They also lose their reflectivity property by the oxidation of aluminum during the duration period.
- ATO (antimony tin oxide) or similar materials have very high reflectivity values . But they are toxic metals.

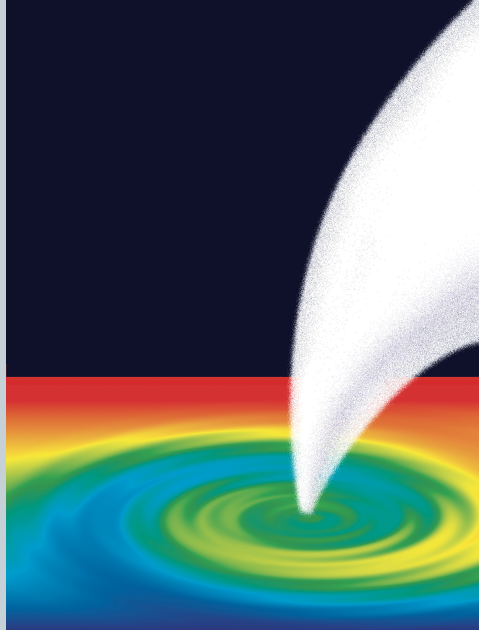


Usage Instructions For Thermosphere Glass Microspheres in Paints & Coatings



- They don't need high speed dispersion process to mix into paint, they can be mixed at the final stage of paint formulation by a simple mixing process.
- Wetting and dispersing agents can be reduced in significant amounts
- They don't absorb water, binder or additives present in the formulations by their round ceramic sphere surfaces which help to reduce the amount of all these ingredients,
- They don't have pore structures like the other extenders which create using of extra amount of anti foaming agents
- They don't settle down during the storage
- The only disadvantage of glass microspheres is their light weights which may cause some floatation problems during the in-can stability. This can easily solve by viscosity increase or matrix structure developments. But they also re-mix very easily
- They help to film formation by their microsphere structures

Thermospheres for Paints & Coatings



- Thermosphere 325
- Thermosphere 700
- Thermosphere 800

***Paints & Coatings are not decorative and protective only,
They are also heat insulating !***

Usage amounts for the best insulation result.



Thermosphere suggested usage amounts are as follows;

- Thermosphere 325 : 8-11%
- Thermosphere 700 : 8-11%
- Thermosphere 800 : 2-6%

Some Visual Reference To Show How It Works

