UTILIZING THE SELECTIVE WAVELENGTH METHOD™

Infrared is a method of efficiently transferring energy from a radiant emitter to a product. Molecules within the product are excited by the infrared radiation and vibrate. Consequently energy levels are raised resulting in increases in temperature; changes in state (liquid to gas); or to polymerize/cure (combine molecules into more complex molecules).

Every organic material has a unique spectral absorption curve for a specific thickness. There will be peak wavelengths where the material absorbs very well and valley wavelengths where it is virtually transparent to the applied energy. Most materials have absorption peaks falling between 2.0 and 5.0 microns.

Long wavelength infrared emits energy between 4.0 and 6.0 microns, with energy densities of 5 to 15 watts per square inch. Medium-wavelength infrared emits energy between 2.4 and 4.0 microns with energy densities of 15 to 60 watts per square inch. Short-wavelength infrared emits energy between 1.0 and 1.2 microns with energy densities between 100 and 200 watts per square inch.

The Selective Wavelength Method™ takes into consideration the thickness of the material or coating to be processed, the spectral absorption curve for the product, and the process goals.

Figure 1 shows the absorption curve for polypropylene. Both the 1 mil and 10 mil thick materials will absorb all of the available infrared emitted between 3.4 and 3.5 microns, however, at 4 microns, the 1 mil thick material will absorb only 10% of the available energy, allowing the balance to pass through while the 10 mil thick material will absorb 45% of the available energy. In general, the thicker the material, the more energy will be absorbed.

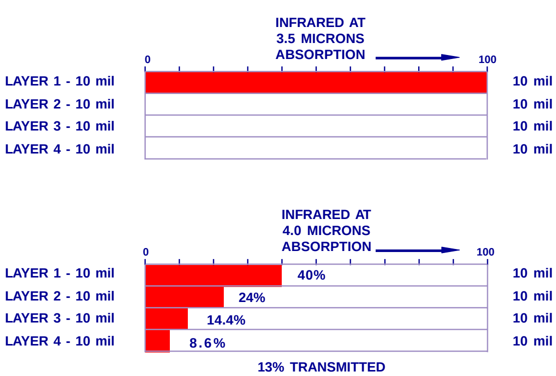
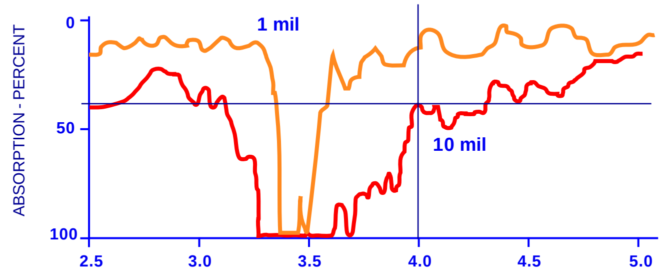
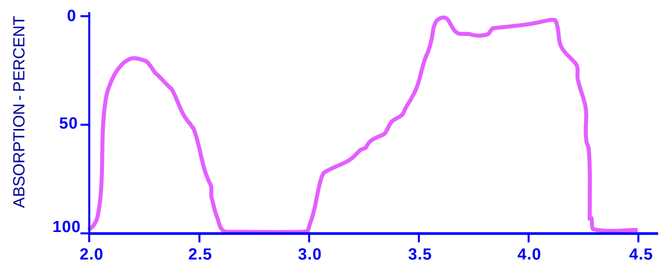


FIGURE 3
ABSORPTION OF INFRARED ENERGY
INTO 40 mil POLYPROPYLENE



WAVELENGTH - POLYPROPYLENE
FIGURE 1



WAVELENGTH - WATER
FIGURE 2

By defining the goal of the process, **SWM™** directs us toward the proper choice of infrared heater and its optimum emitting wavelength. For example, with a 1 mil thick waterbase coating on a 1 mil thick polypropylene film the goal is to transfer the maximum energy to the water in the coating, with minimal pickup by the film. In selecting an emission wavelength of 2.6 - 3.0 microns, which is a peak absorption point for water (Figure 2) efficiencies of greater than 80% are achieved. The polypropylene film is almost transparent to these wavelengths, absorbing less than 15% of the energy. Efficiency is maximized with absorption of the energy into the coating and preventing wasted energy in heating the film.

On thick gauge materials, **SWM™** can be used to select the proper infrared heater and emitting wavelength to provide either surface heating or energy penetration into the material. Figure 3 illustrates energy penetration into a 40 mil polypropylene sheet at emission wavelengths of 3.5 and 4.0 microns.

Through the use of short, medium and long wavelength emitters, only Casso-Solar can select the infrared heater that is best for your process - **SWM™** - **The Radiant Solution™**.

CASSO-SOLAR CORPORATION
ISO 9001 CERTIFIED

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