SBH SOLUTIONS

Reducing Energy Intensity

Clearing Up differences between short wave and other infrared heating options for open spaces and outdoor areas

Introduction

There are plenty of claims in the market place about the performance of infrared heaters. This article seeks to clarify the confusion that even some manufacturers have about the nature and type of infrared heating their products produce.

Efficiency of Infrared Heater

There are two factors in efficiency:

1. What is the predominant wave length of the infrared?
2. How well is the heat projected and reflected?

Long wave or 'Far Infrared' is the least effective space heater for open spaces:

- The emitters are resistance wire, often a Ferrochromium alloy coiled in a steel tube. The output is the 300°C range, which is considered 'low intensity'.
- Far infrared heaters have a radiant efficiency of only 40% with 60% of the energy generated heating air and so susceptible to air movement – not a problem in an enclosed area such the room of a house, but very ineffective outdoors or in large open spaces.
- Far infrared heaters take time to reach their peak efficiency and temperature – between 5 minutes and even 20 minutes according to some manufacturers, so attempting to pre-heat an area is a necessity.
- Far infrared has the advantage of being completely unobtrusive due to there being virtually no visible light in this part of the spectrum. This is why these 'black heaters' are popular in outdoor alfresco areas and why far infrared is used for painted panels mounted on walls inside enclosed rooms.
- Gas fired tube heaters mostly emit Far infrared. They work by having hot exhaust gases from combustion travelling inside a steel tube resulting in the tube surfaces reaching up to 600°C and radiating to the atmosphere. Often used to heat open spaces they do require large volumes of gas to be effective due to the relatively low radiant efficiency.

Medium wave Infrared is more effective in space heating open areas:

- The emitter is a metal, often a Ferrochromium alloy, coiled in a quartz tube, or a Carbon filament coiled in a quartz tube. The quartz tube allows higher temperatures to be achieved compared to Far Infrared, and the output is in the 900°C range, which is considered 'medium intensity'.
- Medium wave infrared heaters have a radiant efficiency of 60%, so 40% of the energy generated is heating air and so susceptible to air movement – they can give good coverage to an open-space but the range is limited so the relative cost to heat

an area can be high and often the wattage needed requires a dedicated electrical circuit. *Any claim that a Medium wave infrared heater is 92% efficient is incorrect.*

- Medium wave infrared heaters can take between 30 seconds and 60 seconds to reach their peak efficiency and temperature, so often they are put on to pre-heat an area and left on to keep an area warm.
- Medium wave infrared has the advantage of giving a warming glow 'ambience' compared to Far infrared as a small part of their energy (1.5%) is visible. The nature of the radiant efficiency tends to mean that reflectors are narrow and focus the heat into limited areas.
- Gas fired ceramic heaters are predominantly Medium wave infrared. They work by combustion taking place on a ceramic tile surface with temperatures reaching up to 1000°C. This heat is radiated into the air and down on to surfaces, often with deflectors focusing the heat into an area. These will provide good spot heating but there is still wastage due to the amount of energy used to heat air directly.

Short wave or 'Near Infrared' is the most effective means of space heating open spaces:

- The emitter is a halogen lamp with a tungsten coil sealed in a quartz tube. The interaction between halogen gas and tungsten element within the quartz tube allows the highest temperatures to be achieved, and the output is in the 2200°C range, which is considered 'high intensity'.
- As a result, Short wave infrared heaters have a radiant efficiency of 92%+, so only 8% of the energy generated is heating air. That is why they give excellent coverage to open spaces because Short wave infrared warms people and surfaces first and foremost. When combined with efficiently designed and well-made parabolic reflectors, the working range of relatively low powered heaters can be surprisingly large.
- Short wave infrared heaters also have the advantage of offering instant heat as maximum efficiency is reached within 1 second of switch on. This makes them ideal for spot heating, with no pre-heating required, even in areas with air flow because like the sun's rays they travel through the vacuum to radiate off objects. The ability to turn on and off instantaneously saves energy so they are often placed on timers or proximity switches.
- Short wave infrared gives a slightly brighter 'ambient' glow when compared to Medium wave because it is the closest to the visible part of the light spectrum. 6% of the energy emitted is seen as visible light and innovations in recent years to counteract the objection of 'harsh light' have reduced this through gold coatings on the quartz tube and /or different colour reflectors. The nature of the radiant efficiency tends to mean that reflectors are wider and parabolic, so can achieve larger areas of coverage for the same wattage compared to Medium or Far infrared.
- Of the three, short wave infrared is the most intense and needs to be mounted at the correct height to ensure that the intensity is dissipated correctly to maximise area heated and minimise hot spots.

Predominant Wave length:	Short Wave IR-A	Medium Wave IR-B	Long Wave IR-C
Emitter / Lamp material	Halogen / Tungsten Coil / Quartz Glass Tube	Ferrochromium Alloy or Carbon Filament Coil / Quartz Galls Tube	Ferrochromium Alloy Coil / Steel Tube
Visible Light	6%	1.5%	Nil
Emitter Temperature	2200°C	900 – 1000°C	300 – 600°C
Area warmed by 1 x 2000W output	Up to 20m^2	Up to 9m^2	Up to 4m^2
Time to max. radiance	1 second	30 seconds – 1 minute	5 minutes – 20 minutes
Affected by airflow	Minimal	Yes	Yes
Maintenance	Minimal – up to 7000 hours lamp life	Electric – minimal up to 10000 hours lamp life Gas – ongoing maintenance	Electric – minimal Gas – ongoing maintenance