



## **Question**

There are numerous brands of electric heaters advertising to heat an entire room for pennies a day. Do you have any information we could share with our members as to how and if these heaters are efficient? Have you metered any of these types of devices with the heat lamp style bulbs in them to see how many kWhs they are using a day or month? I would appreciate any information I could share with our members.

## **Response**

Heat lamp style heaters are electric radiant (also known as infrared) heaters. This type of heater provides warmth in the same way that the sun's rays or a warm fireplace does. Radiant heaters use a variety of heating elements (including quartz tubes, carbon tubes, metal coils, and halogen lamps) to emit radiated heat in a specific direction. Some types use reflectors to focus the heat; others simply allow the heat to dissipate in the direction the heater is facing. Radiant heaters are better suited to heating objects (usually people) than entire spaces, and they work best in areas with open architecture (not many doors or other obstructions). Objects must be within the heater's line of sight to feel the heat. Over time, radiant heaters will increase air temperature as the people and objects that absorb the radiant heat directly transfer some of it to the air.

Some advertisements for radiant space heaters claim that they save large quantities of energy. Although that can be true, it is only if they are used in a very specific manner. To achieve such a high amount of savings, you have to turn down the central heating system considerably and then use radiant space heaters to heat only those areas that are occupied by people. (For example, one company we're aware of claims savings based on setting the house thermostat to 50 degrees Fahrenheit and moving the portable heater to occupied rooms.) The radiant heat warms occupants and the objects surrounding them. Due to this direct radiant warming, the indoor air temperature does not need to be set as high, which reduces the amount of energy consumed by the central heating system.

If you plan on being in a room for only a short period, a radiant heater is the best option for space heating. They can be more efficient over a short period than other heater types because radiant heaters avoid the energy needed to heat the entire room by instead directly warming the occupant of the room and the occupant's immediate surroundings. Radiant heaters are sometimes referred to as quartz, infrared, parabolic, ceramic, halogen, and reflective heaters.

We haven't metered any of these devices ourselves, but I do have some typical energy use data for electric and electric radiant heaters, which I've included below. I've also provided a lot of other information, including how to make the best choice between space heaters, which I believe will be helpful to your members.

### ***Energy Cost Analysis of Space Heaters***

A typical portable electric space heater uses between 600 and 1,500 watts (W), with the medium heat setting consuming around 1,000 W (1 kilowatt). A typical application might use a space heater for 8 hours a day, 5 days a week. Assuming an electric rate of \$0.09 per kilowatt-hour, a portable electric space heater used this way will cost approximately \$15.26 to operate for one month. A radiant heating panel on the medium heat setting would cost about \$9.16 per month.

In general, the efficiency of an electric space heater is essentially 100 percent. In other words, all of the electricity it consumes will be given off as heat. Space heaters that burn natural gas have a typical efficiency ranging between 55 and 80 percent, because some of the heating energy in the fuel is lost during combustion.

### ***Space Heater Options***

Space heaters are typically used either to supplement an inadequate existing heating system or to save energy and defray energy costs in one of the situations described above. In either of these cases, look for a heater that has a design and safety features that match your needs. To pick a design that works well in a certain situation, it is important to understand the different types of space heaters that are available.

***Radiant heaters.*** (described above.)

***Convection heaters.*** The main difference between a convection heater and a radiant heater is air flow. Convection heaters rely on the natural pattern of rising hot air to heat a room. They are designed to heat an entire room by heating the air, rather than focusing the heat on any particular object, and so they work best in rooms that can be sealed off (usually by closing a door). One example is a portable electric baseboard-style space heater. With a baseboard heater, air circulates through the room and enters the baseboard heater on the floor. The air is then warmed by passing across the electric element in the heater and rises through the room. The cold air in the room descends to enter the heater, and the cycle is repeated. The most efficient convection heaters are oil- and water-filled heaters. These employ a heating element in a bath of oil or water. The oil or water remains heated while the unit is on and heats the surrounding air by way of natural air movement through the unit, similar to an electric baseboard heater. These oil- or water-filled units look like a portable radiator.

***Combination heaters.*** Many space heaters employ both radiant and convection heating techniques. These combination heaters are sometimes regarded as having more flexible operating use requirements than conventional heaters. One example of this type of heater is a ceramic radiant heater that uses an internal fan to distribute the heat it generates. Combination heaters heat specific objects in addition to the air surrounding them, although they don't do either as well as a heater designed solely with either radiant or convection technology would. Combination heaters are also called heater fans.

### **Energy Cost Analysis**

A typical portable electric space heater uses between 600 and 1,500 watts (W), with the medium heat setting consuming around 1,000 W (1 kilowatt). A typical application might use a space heater for 8 hours a day, 5 days a week. Assuming an electric rate of \$0.09 per kilowatt-hour, a portable electric space heater used this way will cost approximately \$15.26 to operate for one month. A radiant heating panel on the medium heat setting would cost about \$9.16 per month. Operating cost noticeably increases for combustion heaters, with unit heaters weighing in at just under \$400 each month for a midrange capacity and utility heaters costing a little over \$300 each month for the midrange capacity.

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typical efficiency ranging between 55 and 80 percent, because some of the heating energy in the fuel is lost during combustion. However, EPA's 2005 requirements require that all unit heaters manufactured after July 2008 must have specific technologies that will help increase their average efficiency to around 80 percent.

### **Before You Buy**

Before you jump onto the space heater bandwagon, it will likely be beneficial to perform some easy and inexpensive energy-saving measures at your workplace or home. Any one of these could solve your heating problems without any additional heating equipment.

- Weatherize the building: Install caulking and weather stripping around doors and windows and add insulation.
- Clean or replace the furnace air filter regularly.
- Insulate heating ducts.
- Verify that heat registers are not blocked (by furniture or other objects) or clogged.
- Seal off registers in unused spaces.

These measures can be implemented in just a few hours, and any costs are usually recouped in savings over just a few months.

### ***Is the Application Appropriate?***

Space heaters won't be the right choice for every application, but they can save energy and money in some cases, such as:

- \* When using only part of a facility that has a central heating system that cannot isolate the area in use
- \* When only a small fraction of a large facility is occupied, such as a shipping desk in an unheated warehouse
- \* When specific tasks of limited duration must be performed in an otherwise unheated space

### ***How to Make the Best Choice Among Space Heaters***

Once you've decided that space heaters are right for your business, it is helpful to answer a few questions to help determine the proper type of space heater that will suit your needs. For example:

- \* Do you have a preference on whether it uses electricity or natural gas? Are both available where the heat is needed?
- \* Where do you plan to use the space heater? In what areas or rooms, specifically? What tasks will be performed there?
- \* In general, how often and for how long will the heater be in use—periodically or constantly?
- \* What features are important for your application?

***Sporadic usage, spot heating.*** If you need help "filling the gap" or simply adding some extra warmth while performing a task at home or at work, a radiant heater will be the best match. They provide heat almost instantaneously but must be located fairly close to warm an occupant effectively. The main caveat with these types of heaters is that they can be a fire hazard, so safety precautions must be taken in order to prevent fires, burns, or other damage. Examples of where these heaters might be used are for a person working at a desk or sitting on a couch; these perform well when the object to be warmed is relatively stationary.

In some instances, it makes sense to use a radiant heating panel: These are varying-sized electric panels that are mounted to a surface (wall, ceiling, or floor) and radiate heat to an object directly in front of them. They operate completely silently, are cool to the touch, and typically consume less power than a traditional radiant heater; they also produce less heat, but can work well to provide some heat for a person sitting at a desk or other small enclosed area with a nearby mounting surface.

**Constant operation, whole-room heating.** If you plan to use the space heater for extended periods of time or to heat an entire room and a conventional central heating system is impractical, a convection heater will most likely be your best choice. Either an oil- or water-filled radiator heater or a portable baseboard-style heater will work. Unlike radiant heaters, convection heaters cannot provide instantaneous spot heating, but instead gradually warm the air in the room. They provide an even, comfortable heat through natural convection of the room air. Most of these heaters are silent and cool to the touch.

**Varied operation, versatile tasks.** If the space heater will be used for a variety of tasks, a combination heater—employing both radiant and convection techniques—is best. These are currently the most commonly used space heaters. Any space heater with a heating element and an internal fan can be classified as a combination heater. These heaters can be used to warm up an entire room (although not as evenly as a true convection heater) and to heat a stationary person (again, not as efficiently as a true radiant heater). Many people enjoy the versatility of these portable types. These heaters can also be a fire hazard, so it is important to operate them in areas where they're unlikely to come into contact with flammable materials such as paper.

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