

Implementation of Infrared Heater in Hydraulic Press

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ABSTRACT: The main objective of the project is to implementation of infrared heating system in the hydraulic press for perfect lamination the main purpose of heating system is to provide proper lamination of polymers over the interior parts of the cars. The heating should be made in fraction of seconds by means of radiation and also stimulating the atoms of the polymers such as polyvinylchloride, polypropylene and polyofine (sika9171) and getting heated. The sika9171 which acts a glue between the car interior and other polymers (polypropeline and car polyvinylchloride) which gets heated and helps in the setting of proper laminations.

KEYWORDS: infrared heating system, radiation, sika9171, polymers, laminations.

I. INTRODUCTION

The objective of this project is to provide proper lamination of the pvc, polypropelene ,sika layers over the car interiors .It is needed in the surface of armrest.the infrared method is to be used instead of gluing which is practiced before, and it resulted sometimes in the improper lamination.this heating method will ensure proper lamination . An infrared heater or heat lamp is a body with a higher temperature which transfers energy to abody with a lower temperature through electromagnetic radiation. Depending on the temperatureof the emitting body, the wavelength of the peak of the infrared radiation ranges from 780 nm to1 mm. No contact or medium between the two bodies is needed for the energy transfer. Infraredheaters can be operated in vacuum or atmosphere.

Short wave or near infrared for the range from 780 nm to 1400 nm, these emitters are alsosnamed bright because still some visible light is emitted.Medium infrared for the range between 1400 nm and 3000 nm.Far infrared or dark emitters for everything above 3000 nm.

Industrial infrared heaters sometimes use a gold coating on the quartz tube that reflects theinfrared radiation and directs it towards the product to be heated. Consequently, the infraredradiation impinging on the product is virtually doubled. Gold is used because of its oxidationresistance and very high IR reflectivity of approximately 95%. Infrared heaters are commonly used in infrared modules combining severalheaters to achieve larger heated areas.

Infrared heaters are usually classified by the wavelength they emit:

Near infrared (NIR) or short-wave infrared heaters operate at high filament temperatures above1800 °C and when arranged in a field reach high power densities of some hundreds of kW/m².Their peak wavelength is well below the absorption spectrum for water, making them unsuitable formany drying applications. They are well suited for heating of silica where a deep penetration is needed.

Medium-wave and carbon (CIR) infrared heaters operate at filament temperatures of around1000 °C. They reach maximum power densities of up to 60 kW/m² (medium-wave) and150 kW/m² (CIR).

Far infrared emitters (FIR) are typically used in the so-called low-temperature far infrared saunas.These constitute only the higher and more expensive range of the market of infrared sauna.Instead of using carbon, quartz or high watt ceramic emitters, which emit near and mediuminfrared radiation, heat and light, far infrared emitters use low watt ceramic plates that remain cold,while still emitting far infrared radiation.[5]The relationship between temperature and peak wavelength is expressed by Wien's displacementlaw.

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Metal wire element

Metal wire heating elements first appeared in the 1920s. These elements consist of wire made from chromel. Chromel is made from nickel and chrome and it is also known as nichrome. This wire was then coiled into a spiral and wrapped around a ceramic body. When heated to high temperatures it forms a protective layer of chromium-oxide which protects the wire from burning and corrosion, this also causes the element to glow.

Heat lamps

A heat lamp is an incandescent light bulb that is used for the principal purpose of creating heat. The spectrum of black body radiation emitted by the lamp is shifted to produce more infrared light. Many heat lamps include a red filter to minimize the amount of visible light emitted. Heat lamps often include an internal reflector.

Heat lamps are commonly used in shower and bathrooms to warm bathers and in food-preparation areas of restaurants to keep food warm before serving. They are also commonly used for animal husbandry. Lights used for poultry are often called brooding lamps. Aside from young birds, other types of animals which can benefit from heat lamps include reptiles, amphibians, insects, arachnids, and the young of some mammals.

The sockets used for heat lamps are usually ceramic because plastic sockets can melt or burn when exposed to the large amount of waste heat produced by the lamps, especially when operated in the "base up" position. The shroud or hood of the lamp is generally metal. There may be a wire guard over the front of the shroud, to prevent touching the hot surface of the bulb.

Ordinary household white incandescent bulbs can also be used as heat lamps, but red and blue bulbs are sold for use in brood lamps and reptile lamps. 250-watt heat lamps are commonly packaged in the "R40" (5" reflector lamp) form factor with an intermediate screw base. Heat lamps can be used as a medical treatment to provide dry heat when other treatments are ineffective or impractical.

Ceramic infrared heat systems

Ceramic infrared heating elements are used in a diverse range of industrial processes where long wave infrared radiation is required. Their useful wavelength range is 2–10 μm . They are often used in the area of animal/pet healthcare too. The ceramic infrared heaters (emitters) are manufactured with three basic emitter faces: trough (concave), flat, and bulb or Edison screw element for normal installation via an E27 ceramic lamp holder.

Far-infrared

This heating technology is used in some expensive infrared saunas. It is also found in space heaters. These heaters use low watt density ceramic emitters (usually fairly big panels) which emit long wave infrared radiation. Because the heating elements are at a relatively low temperature, far-infrared heaters do not give emissions and smell from dust, dirt, formaldehyde, toxic fumes from paint-coating, etc. This has made this type of space heating very popular among people with severe allergies and multiple chemical sensitivity in Europe. Because far infrared technology does not heat the air of the room directly, it is important to maximize the exposure of available surfaces which then re-emit the warmth to provide an even all round ambient warmth.

Quartz heat lamps

Halogen lamps are incandescent lamps filled with highly pressurized halogen gas. This gas is combined with a small amount of bromine or iodine which causes tungsten atoms to regenerate by lessening the evaporation of the filament. This leads to a much longer life of halogen lamps than incandescent lamps. Due to the high pressure and temperature halogen lamps produce, they are relatively small and made out of quartz glass because it has a hotter melting point than standard glass. Common uses for halogen lamps are table top heaters. Quartz infrared heating elements emit medium wave infrared energy and are particularly effective in systems where rapid heater response is

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required. Tubular infrared lamps in quartz bulbs produce infrared radiation in wavelengths of 1.5–8 μm . The enclosed filament operates at around 2500 K, producing more shorter-wavelength radiation than open wire-coil sources. Developed in the 1950s at General Electric, these lamps produce about 100 W/in (4 W/mm) and can be combined to radiate 500 watts per square foot (5400 W/m²). To achieve even higher power densities, halogen lamps were used. Quartz infrared lamps are used in highly polished reflectors to direct radiation in a uniform and concentrated pattern. Quartz heat lamps are used in food processing, chemical processing, paint drying, and thawing of frozen materials. They can also be used for comfort heating in cold areas, in incubators, and in other applications for heating, drying, and baking. During development of space re-entry vehicles, banks of quartz infrared lamps were used to test heat shield materials at power densities as high as 28 kilowatts/square foot (300 kW/m²). Most common designs consist of either a satin milky-white quartz glass tube or clear quartz with an electrically resistant element, usually a tungsten wire, or a thin coil of iron-chromium-aluminum alloy. The atmospheric air is removed and filled with inert gases such as nitrogen and argon then sealed. In quartz halogen lamps, a small amount of halogen gas is added to prolong the heater's operational life. Much of the infrared and visible energy released is caused by the direct heating of the quartz material, 97% of the near infrared is absorbed by the silica quartz glass tube causing the temperature of the tube wall to increase, this causes the silicon-oxygen bond to radiate far infrared rays. Quartz glass heating elements were originally designed for lighting applications, but when a lamp is at full power less than 5% of the emitted energy is in the visible spectrum.

Quartz tungsten

Quartz tungsten infrared heaters emit medium wave energy reaching operating temperatures of up to 1500 °C (medium wave) and 2600 °C (short wave). They reach operating temperature within seconds. Peak wavelength emissions of approximately 1.6 μm (medium wave infrared) and 1 μm (short wave infrared).

Carbon heater

Carbon heaters use a carbon fiber heating element capable of producing long, medium and shortwave far infrared heat. They need to be accurately specified for the spaces to be heated.

Gas-fired

There are two basic types of infrared radiant heaters. Radiant tube gas-fired heaters used for industrial and commercial building space heating burn natural gas or propane to heat a steel emitter tube. Gas passing through a control valve flows through a cup burner or a venturi. The combustion product gases heat the emitter tube. As the tube heats, radiant energy from the tube strikes floors and other objects in the area, warming them. This form of heating maintains warmth even when a large volume of cold air is suddenly introduced, such as in maintenance garages. They cannot however, combat a cold draught.

Efficiency

Electrically-heated infrared heaters radiate up to 86% of their input as radiant energy. Nearly all the electrical energy input is converted into infrared radiant heat in the filament and directed on to the product by reflectors. Some heat energy is removed from the heating element by conduction or convection, which may be no loss at all for some designs where all of the electrical energy is desired in the heated space, or may be considered a loss, in situations where only the radiative heat transfer is desired or productive. For practical applications, the efficiency of the infrared heater depends on matching the emitted wavelength and the absorption spectrum of the material to be heated. For example, the absorption spectrum for water has its peak at around 3000 nm. This means that emission from medium-wave or carbon infrared heaters is much better absorbed by water and water-based coatings than NIR or short-wave infrared radiation. The same is true for many plastics like PVC or polyethylene. Their peak absorption is around 3500 nm. On the other hand, some metals absorb only in the short-wave range and show a strong reflectivity in the medium and far

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infrared. This makes a careful selection of the right infrared heater type important for energy efficiency in the heating process. Ceramic elements operate in the temperature of 300 to 700 °C (570 to 1,290 °F) producing infrared wavelengths in the 2000 to 10000 nm range. Most plastics and many other materials absorb infrared best in this range, which makes the ceramic heater most suited.

The ceramic heater is very much suited because of its high efficiency compared to other types of heaters and is very much economical compared to that of gold. The other types of heating is not preferred because of the heat transfer is only by means of radiation no more contact with the polymers and the heating element. The ceramic bulb of 2500 watt per each bulb (20 bulbs) is used to ensure the preheating of area of about .75m*1m. The safety measures are to be taken to protect the surrounding from radiation using the radiation shield. In addition to the dangers of touching the hot bulb or element, high-intensity short-wave infrared radiation may cause indirect thermal burns when the skin is exposed for too long or the heater is positioned too close to the subject. Individuals exposed to large amounts of infrared radiation (like Glass blowers and arc welders) over an extended period of time may develop depigmentation of their skin and opacity of the aqueous humor, so exposure should be moderated. The overall process is controlled by means of the solid state relay controllers are used to control the power supply because of its durability and economic aspects. It is very much better than coil type relays in life as well as cost. fuses are used as a safety measure even some overload problem occurs.

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