

Cox, Kyndall

From: Morris, Mitch <Mitch.Morris@williams.com>
Sent: Monday, December 12, 2016 12:13 PM
To: Cox, Kyndall
Subject: E&H Receiver Catalytic Heater Information
Attachments: AmericCat catalytic heaters.doc; DexKnows - how does a catalytic heater work.docx; CCI Thermal NOx & CO emissions for catalytic heaters.pdf

Good Morning Kyndall,

Attached is some information on catalytic heaters similar to the ones used at E&H Receiver. In the initial (March 2010) Application submittal, we conservatively estimated catalytic heater emissions using AP-42 natural gas combustion emission factors. Since that submittal, we had found the attached documentation justifying the removal of these units from the application.

I'm still working with the Operations group here on determining the owner/operator of the 3 production wells located within ¼ mile of E&H Receiver and will provide that information as soon as possible.

Thanks,



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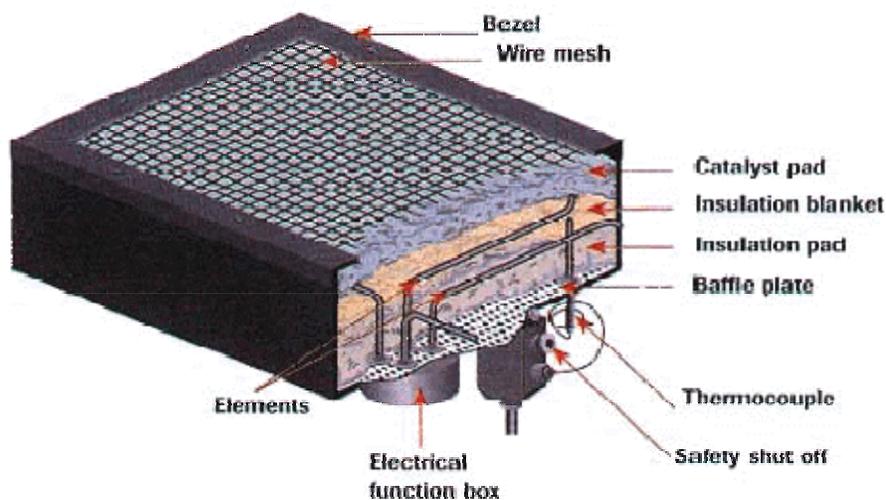
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From the webpage: <http://www.americancatalytic.com/>

AmeriCat™ catalytic heaters oxidize natural gas, propane and butane flamelessly, emitting medium to long wave infrared energy. A platinum catalyst forces combustion below the gas ignition point (1400 Degrees F) generating surface temperatures of 600 - 1000 Degrees F. Since the reaction is totally flameless, there are no CO or NOX emissions associated with open flame gas systems. The only byproducts are carbon dioxide and trace amounts of water vapor. Retrofit electric / gas convection ovens to catalytic infrared ovens and lower energy costs dramatically.

Infrared catalytic heaters emit radiant energy that directly heats the coating on your part, not the substrate or the air in the oven. By rapidly elevating the coating temperature, you will achieve faster cure / dry times using less energy. Add a catalytic booster oven prior to entering your main oven and dramatically shorten your cure time, while eliminating powder blowoff.

For thermoforming applications, you will achieve shorter cycle times, better part quality and reduced scrap while lowering your energy costs.



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From the webpage: http://www.dexknows.com/local/home_improvement/guides_and_videos/how-does-catalytic-heater-work-7053/

<http://www.youtube.com/watch?v=sRPlxggLJAw> a YouTube video with description of design and operation of catalytic heaters

How Does a Catalytic Heater Work?

These propane heaters are efficient, quiet and portable

By Brad Painting

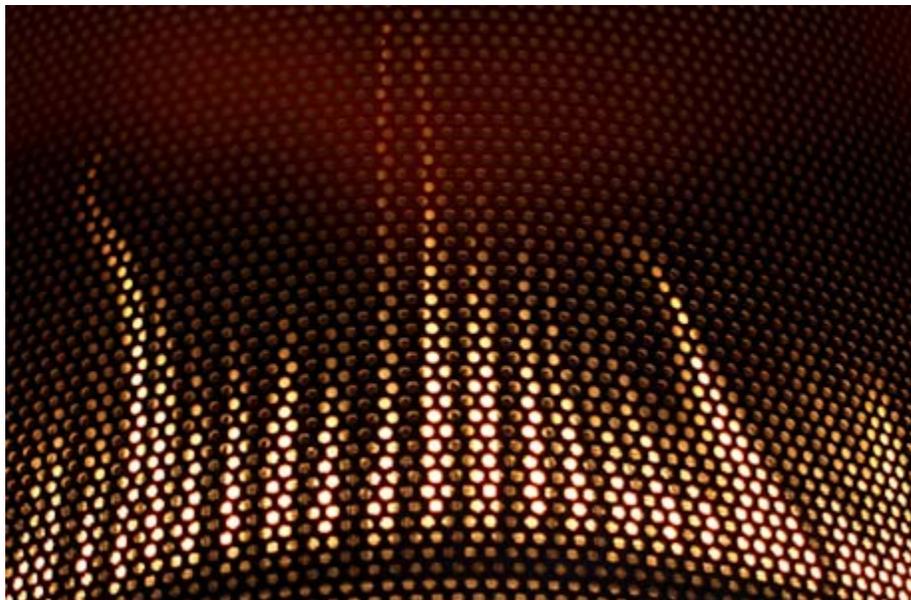


Photo by iStockphoto.com



A catalytic heater is a portable unit that generates heat using propane. Its process is similar to that of a catalytic converter on an automobile, which causes emissions to chemically react into more air-friendly products. Although a catalytic heater works with different chemical reactants than a converter, it shares the property of generating heat without burning a fuel.

Uses

The first catalytic heaters were marketed toward campers and were small enough to hold in one hand. These heaters had a rated heat output of 3,000 BTUs, or British Thermal Units, and were intended for temporary usage inside tents. In later years, larger catalytic heaters emerged with ratings of 8,000 to 18,000 BTUs, which were intended for use in trailers, RVs and motor homes.

Parts

A catalytic heater basically consists of a propane tank, a metal grill, and mesh lined with platinum or other catalyst. A valve controls the flow of propane through the mesh, which creates heat that is absorbed and radiated by the metal grill. The metal grill convects heat and emits infrared waves, just like a standard infrared or radiant heater.

Chemical Reaction

The functioning of a catalytic heater relies on a balanced chemical reaction. Propane and oxygen react and form primarily water vapor and carbon dioxide. The catalyst is the key element which drives the reaction; it splits certain atoms off of molecules and recombines them into new ones. Because some molecules rearrange into lower-energy formations, they compensate by releasing heat.

Advantages

Catalytic heaters are extremely portable; you can use them in most types of enclosures or even place one outside beside yourself when camping. Because they do not rely on a combustion process, they require no gas line or flue. You can simply attach the fuel tank directly to the device and crack open a window for ventilation. They have no motorized parts so they are also quiet and reliable.

Safety

The U.S. Consumer Product Safety Commission (CPSC) analyzed the emissions from two commercial catalytic heaters in 2003. They found that while the amount of carbon monoxide released was small, the heaters' consumption of oxygen could potentially cause hypoxia (suffocation

ventilated spaces.

About the Author

Brad Painting is a regular contributor to DexKnows and specializes in green building design.

From the webpage: <http://www.lincenergysystems.com/linc-energy-blog/entry/what-is-a-catalytic-heater-and-how-does-it-work-1>

What is a catalytic heater and how does it work? IMAC Systems, one of Linc Energy Systems' fine principals has recently introduced a new product, the *Thermcat* Catalytic Heater. Catalytic heaters have been recognized as a reliable, efficient, and safe way to introduce flameless explosion-proof heat to various applications within the natural gas and oil industries.

A **catalytic heater** is a flameless heat source that uses chemical reactions to break down molecules and produce heat. In the presence of a catalyst which is within the heater, counter current combustion or catalytic combustion occurs when natural gas (or liquid propane gas) in the presence of oxygen creates carbon dioxide, water and heat. In this situation the ignition temperature of natural gas occurs at substantially lower temperatures, therefore no flame is involved in the combustion process and far infrared wave emitters are created, producing radiant heat. Once the oxidation begins, the reaction and heating continues until either the oxygen or fuel source is eliminated. The thermal efficiency of catalytic heating is also significantly higher than conventional heating.

From the webpage: <http://www.catcousa.com/products.htm>

How they work:

By definition, a catalyst is any substance that alters the rate of a chemical reaction; during the process, the catalyst is neither consumed nor destroyed. In a catalytic heater, the chemical reaction of oxidizing (burning) natural gas or propane is slowed to about 65% of normal, resulting in a safe, flameless source of radiant heat. In order to become activated, the catalyst bed must be preheated to approximately 250°F; CATCO catalytic heaters are normally equipped with 12 or 120 volt low wattage elements to preheat the catalyst and start the reaction. Other starting voltages are available.

CATCO catalytic heaters are carefully designed to produce the most efficient heat possible. The only by-products of combustion (other than heat) are carbon dioxide and water vapor. Carbon monoxide, a result of inefficient combustion, is not measurable. Every CATCO catalytic heater is operated for one hour and carefully tested to ensure that components are functioning, that the heat output is within specification and that there are no leaks. This ensures that our customers receive the very best quality product that we can produce, one of our continuing goals.

Generally, catalytic heaters can be used in any application requiring a safe source of heat. In addition, they have the advantage of being able to perform without the use of a constant source of electrical power. This makes them ideal for locations where power is not available on a continuous basis.

Some of the applications common for catalytic heaters include:

- Heating pressure reducing valves where there are potential freezing problems
- Heating gas streams going to pilot operated valves and instrumentation
- Space heating in hazardous locations
- Portable and temporary work station heating
- Oven and process heating (Drying operations, Paint curing operations)

