# GAS CATALYTIC OVENS

High Performance,
Energy Efficient
Gas Infrared Systems

CATALYTIC INDUSTRIAL SYSTEMS

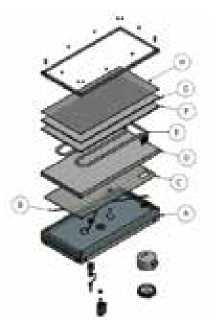
www.catalyticirovens.com

Catalytic Industrial Systems' (CIS) gas catalytic infrared ovens are safe, efficient, and high performing. The ovens are designed and built using a modular approach with multiple heater sizes and arrangements for optimal uniformity of results and complete versatility. Microprocessor based control systems ensure complete control over the ovens operation without compromise. Factory testing of processes ensures the ovens meets application requirements. CIS gas catalytic IR ovens are perfectly suited for industrial heating, drying, and curing applications.

# TECHNOLOGY OVERVIEW

In CIS infrared heating systems, natural or LP gas is brought into contact with a catalyst pad in the presence of oxygen from the air entering the system. The reaction which occurs oxidizes the natural gas into carbon dioxide and water vapor, at the same time generating infrared energy. Because the catalytic reaction occurs at a temperature lower than the ignition temperature of the gas, there is no flame of any kind due to combustion. The reaction continues as long as gas and oxygen are supplied to the catalyst pad.

The radiant energy emitted by the CIS system is a long wavelength infrared energy, which is more readily absorbed by most materials than the shorter wave infrared energy used by many competitive systems. This assures lower operating costs and faster cures.



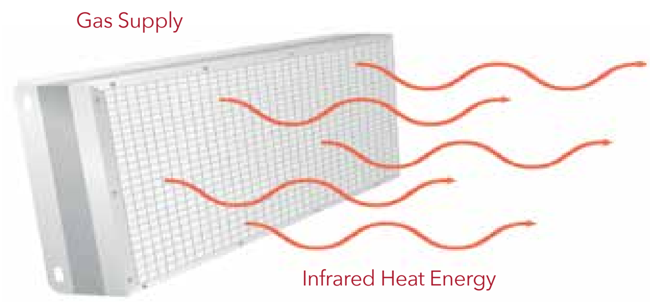
| Item | Description |
|---|---|
| A | HEATER PAN |
| B | DISPERSION TUBE ASSEMBLY |
| C | DISPERSION SCREEN |
| D | 1" INSULATION |
| E | ELECTRIC HEATER ELEMENT |
| F | 0.25" INSULATION |
| G | CATALYST |
| H | STAINLESS STEEL FACE SCREEN |

NOT LABELED: Safety Valve, Thermocouple, Explosion Proof Junction Box

## OPERATIONAL CONCEPT

CIS catalytic heaters requires both electricity and gas to operate. Electric power is required to preheat the heater. During startup, the enclosed electric heating element (ITEM E) is turned on for about 15 to 20 minutes. Once the catalyst has been warmed up, gas can be introduced via the safety valve (not labeled) to begin the catalytic heating process. Gas enters the heater via the dispersion tube assembly (ITEM B) and is dispersed by the dispersion screen (ITEM C). The gas diffuses through the insulation (ITEM D) to come in contact with the catalyst (ITEM G) to initiate the catalytic reaction. Infrared energy is emitted out along with CO2 and water vapor. The thermocouple is used to control the safety valve or the gas solenoid valve. If the catalyst falls below safe operating temperature, the thermocouple will shut off the gas valve to prevent gas from being emitted.

The operation of the heater emitters is simplified with the microprocessor controller. The controller is preset with a desired setpoint. A simple pushbutton on the HMI automatically starts the system with ability to interface to the plant control.




Catalytic Heaters Arranged in Zones

Coating on Product Absorbs Infrared Readily

## CIS OVEN CONTROLS

CIS Oven control systems are simple to operate and offer greater control range. The ovens are built using a modular approach. The heater emitters can be arranged into multiple zones with individually adjustable heat output for each zone. This ensures the oven can be tailored to the material, shape, size, and quantity of parts moving through the oven. The heart of the control system is a microprocessor based PLC system.

CIS PLC control systems include a HMI for operation and control. The controllers are programmed for safety, individual zone temperature, exhaust and recirculation fan monitoring and adjustment automatically. The control systems are factory assembled and tested prior to shipment to ensure minimal onsite integration efforts.

| | Gas Catalytic Infrared | Convection |
|---|---|---|
| Energy Consumption | Infrared energy heats up the coating rather than the substrate. Results in higher energy usage efficiency and lower operating cost | Heats up substrate leading to higher energy usage and operating cost. |
| Cure Time | Reduce curing time by up to 80% | Longer curing time |
| Operation Cost | Lower curing time and higher energy efficiency means lower operating cost | Higher than IR |
| Oven Size | Up to 80% smaller | Longer physical size required |
| Temperature control | Infrared heats up the coating, protecting the substrate from getting overheated | Substrate is heated before coating so higher temperature maybe needed |
| Operational Control | Greater control as wavelength can be adapted to coating used. Can be used with wider range of substrates and coating | Fixed. Only adjustment is heat level and amount of air. Can overheat product with low temperature tolerance. |

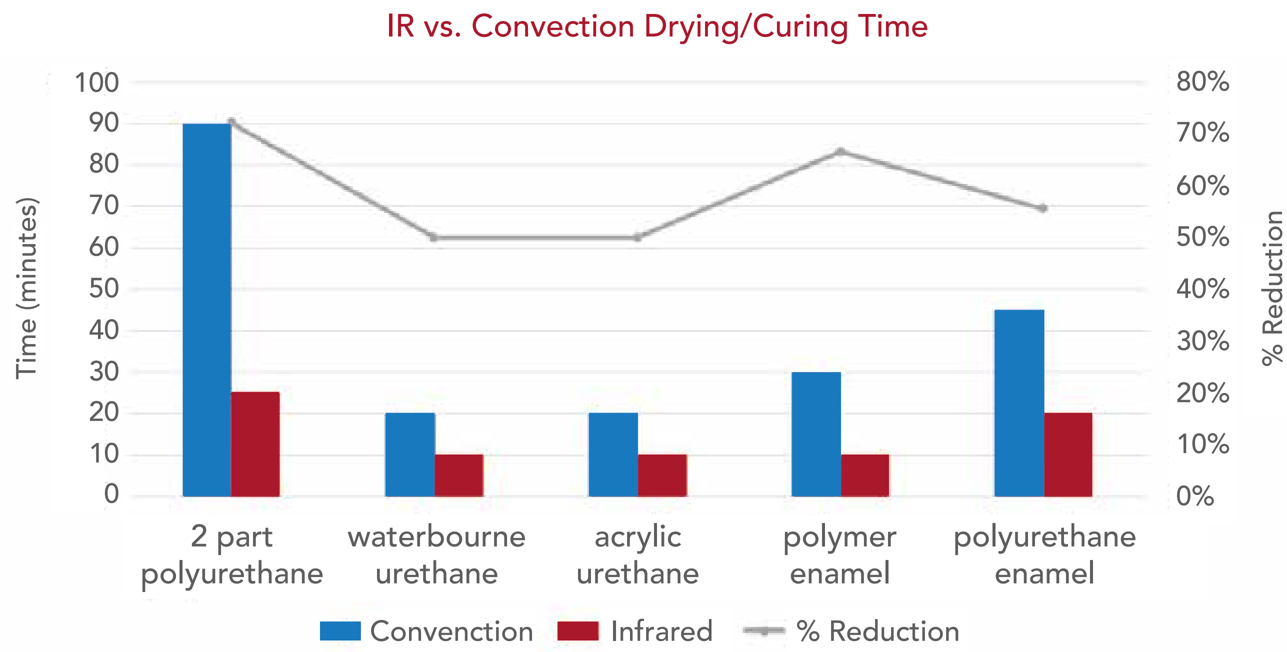


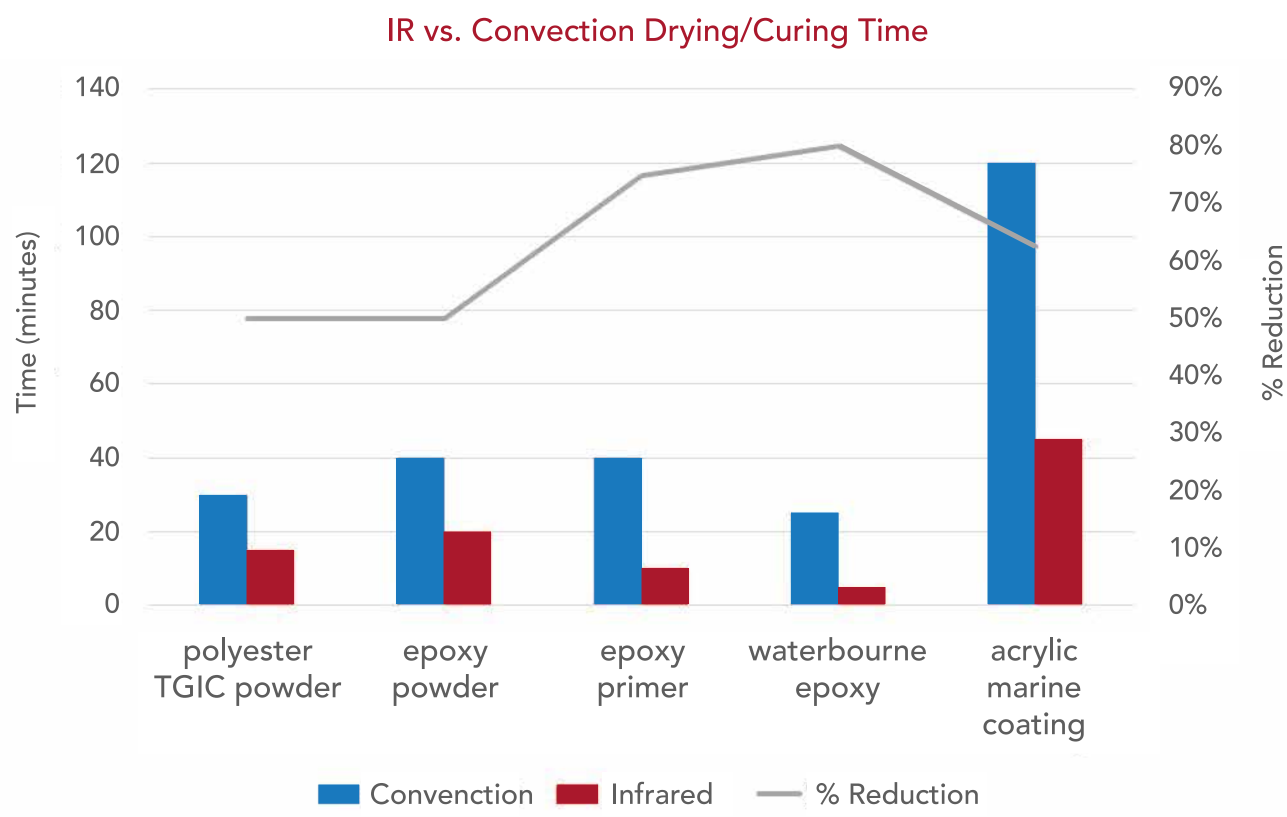
# FEATURES AND BENEFITS

CIS gas catalytic heaters offer unique features when compared to other drying technologies. Unlike traditional gas heaters, CIS gas catalytic heaters burn the gas at significantly lower temperature for a more even heat distribution. Heat is produced as infrared energy, which does not heat the air but only the target object to reduce the energy required. Furthermore, because the infrared energy emitted is matched to the absorption spectrum of water in the 3 to 7 micron range, more energy is directed to the coating material than the base. This combination can lead to a reduction in process time greater than 75% and space requirement by up to 80%.

| Features | Benefits |
|---|---|
| Catalytic long wavelength infrared radiation | Faster cures than conventional methods |
| Flameless | Safety–FM, CSA approved for hazardous areas and coating |
| Smaller Oven Footprint | Saves valuable floor space , less operating expense |
| Natural gas or propane fuel | Utility cost much less and can reduce cost up to 80% |
| Lower operating temperature | More even heat distribution |
| No moving part | Reduces maintenance. No periodic part replacement |
| Stainless Steel heater construction | Rugged-corrosion protection at no added cost |
| Multi-zone operation | Maximum control over heat distribution. Improves process stability and quality of product. |
| Gas Trains | Pressure regulators, high/low safety switches, modulating gas valves that meet NFPA National Fuel Gas Codes |
| Heater zones piped in loops | Provides even gas flow and pressure |
| Oven construction | In full compliance of NFPA 86 with Explosion relief |
| Automated control–PLC Monitored | Reduces setup time, able to store recipes for quicker changeovers |
| Green Technology - Only emits $CO_2$ and water vapor | Cleaner burning, less environmental impact |
| Multiple Safety Rating including FM (Class 1 Division 2) and CSA (Class 1 Division 1) | Reduces installation and approval time |
| Direct heating of coating substance | Reduced energy usage. Increased capacity. Space saving. |

## CIS Gas Catalytic Heater Performance Versus Convection




CIS gas catalytic IR ovens outperforms convection systems by at least 50% for powder and most urethane coatings. The time saving can be as much as 80% for epoxy and polyurethane.

# APPLICATIONS

## Catalytic Infrared Cure Ovens

Catalytic Infrared Cure Ovens provide process flexibility, long service life and exceptional energy efficiency. These systems are well suited to a wide range of curing tasks.

When infrared energy is emitted onto a part that is painted or powder coated, the energy is absorbed by the coating on the substrate, rather than the substrate having to be heated to cure the coating.

A Catalytic infrared cure oven has a faster cycle compared to convection. Product positioning, the distance from the emitter to the surface of the part, and the intensity of the emitters, also impact how well, and how quickly, a full cure can be achieved.

## Combination Infrared and Convection Systems

These are the best of both worlds for many applications, particularly for powder coaters and facilities that process a variable mix of parts.

In a combination oven, the infrared portion of the oven gels, or sets, the powder coating ahead of the convection oven portion. This accelerates the convection soak portion that completes the cure. The infrared energy used in this ramp-up zone also prevents powder loss by setting the finish before it can be disturbed by the air turbulence in the convection section. It can also help to prevent cross-contamination in facilities that use more than one color of powder.

The use of infrared ahead of convection cure also reduces total energy use. Infrared energy heats just the coating and the product surface to the temperature level where convection is effective. This reduces the volumes of circulating hot air used to reduce both cycle time and utility costs.

## Infrared Retrofits

A cost-effective alternative to a new system when an existing oven is unable to cure products properly due to increased production demands. Also effective when changing from wet to powder coating.

CIS can design and build retrofit kits or booster sections to fit space and line speed constraints. Adding infrared technology to an existing oven provides several advantages including: increased production capability and line speed, reduced capital investment, and minimal downtime for installation.

CIS retrofit kits are complete with all mechanical assembly, gas trains, and control system that can be integrated to existing control systems for seamless results.

## Application Examples

### Catalytic Industrial reduced cure cycle, minimize conveyor length

A global manufacturer of excavating machines needed to increase their production cycle without adding additional floor space. Their existing process to dry the weldments weighing up to 12,000 pounds took up to 8 hours to dry. The proposed convection system would have required over 200 feet of additional space.

CIS designed and built an infrared oven for the application. The infrared oven dried the paint in 15 minutes, an 97% improvement, in only 100 feet of space. The reduced space and faster drying time allowed additional savings in the conveyor system.

### Catalytic Infrared Solution that cuts cycle time from 4 hours to 45 minutes while meeting curing specifications

A wind turbine manufacturer in Colorado had multiple manufacturing issues. The larger blades were being stages to go into the flash tunnel, which took over four hours to cure. This created a bottle neck in the staging area leading to defects in the paint after curing. The paint supplier required a defect free cure to guarantee 20 year life.

CIS worked with the turbine blade manufacturer, and the paint supplier, to develop a gas catalytic IR solution. With extensive testing both at CIS' factory and onsite, the paint supplier approved a solution to retrofit the flash tunnel with over 100 feet of IR heating. Now the 135 feet plus long turbine blades can move through the tunnel continuously without stopping and cure in 45 minutes. This resulted in more than 75% reduction in the cure time, resolved the bottle necking issues, and met the curing specifications of the paint supplier to get the 20 year paint performance guarantee.

### Worldwide leading manufacture of construction, and mining equipment choose CIS to cure 32 times faster than before

Two gas-fired Catalyticic Infrared Oven systems have reduced paint drying time for this world leader in construction equip-ment's crane and excavator weldments from 16 hours to less than 30 minutes. Massive parts ranging upto 50 feet in length and weighing as much as 30,000 pounds are cured and dried 32 times faster than before.

The goal of the project was to speed paint drying time which would not only increase production capacity but would free-up plant production space.  The catalytic technology generates long-wave infrared radiation which is more readily absorbed bymost materials. This results in lower operating cost and faster, higher-quality finishes.

# OVEN DESIGN APPLICATION DATA SHEET

Please return this completed data sheet to sales@catalyticirovens.com to begin the design process.

**Application Type**

☐ Retrofit ☐ Expansion ☐ New Oven

**Area for Proposed Oven**

Length _____ Width _____ Height _____

**Conveyor Data** (Check Applicable. Leave blank if not.)

☐ Overhead ☐ Power and Free ☐ Indexing

☐ Flatline ☐ Chain on Edge ☐ Manual Feed

Current Speed ____ Desired Speed _____

Distance from Floor to Top of Conveyor Rail ____

**Parts Description**

Please provide description, drawings, prints or photos of method of "hanging" parts with dimensions, hanger type, length, etc.

Part Material(s): ☐ Steel ☐ Aluminum ☐ Wood ☐ Other

| | | |
|---|---|---|
| Part Size(s): | Maximum | Minimum |
| | Height _____ | Height _____ |
| | Width _____ | Width _____ |
| | Length _____ | Length _____ |
| Part Thickness: | Maximum _____ | Minimum _____ |
| | Guage _____ | |

Maximum Part Window Required:

Width _____ Height _____

**Coating Information**

Type: ☐ Powder ☐ Solvent ☐ Waterborne ☐ Other

Desired MIL Thickness: Wet _____ Dry _____

Part Temperature Prior to Coating: From_____ to _____ F°/C°

Flash Time from (state to stage): _________________

Coating Specs: Cure Time _____ Cure Temperature _____

Technical Data Sheets and Material Safety Data Sheets are Required for Each Coating to be tested. Include solvent date (one for each type used).

Utilities: Volts ____

Electrical: Phase ____

Fuel Type: ☐ Natural Gas ☐ Propane

Fuel Pressure: PSI _____

**Additional Notes**

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