



A TechnicalHelp4U.com presentation:

Our thoughts on powder coating ovens

Build my own or buy professional?

Let me begin by saying that there is a serious threat of fires, explosions, personal harm and/or death with an unsafe oven installation. It is imperative that installers, operators, maintenance personnel and managers recognize these threats and act accordingly. Over the past 15 years I have seen **three installations go up in smoke** due to unsafe ovens and **one person needlessly died**.

You want to build an oven?

Can you install and do you understand the following safety devices?

- Motor Overloads
- Fan Proving Air Cells
- Purge Timers
- Powered Exhaust
- Deviation Control Programming
- Guards for Moving Parts
- Explosion Relief Doors/Hatches
- High Limit Control
- Door Switches
- Safety Shutoff Valve
- High/Low Gas Pressure Switch
- Combustion Safeguard System

Sure, for a hobby powder coater go ahead and buy an old oven for your parts.

You could even build your own oven:

1. use low-watt density Incoloy (or similar) sheathed heaters – remember to follow UL guidelines and ensure your heater loads are broken into circuits no higher than 48 amps each
2. use 16 gauge aluminized steel for the interior shell (aluminized is important for reflectance).
3. Insulate your oven with 3-5 inches of 6 # mineral wool and top off the outer frame with heavy duty structural steel.

You can purchase prefab oven panels from [Rapid Industrial Finishing 1-800-536-3461](http://RapidIndustrialFinishing.com), they are online at www.RapidEngineering.com. Make sure you take into account NFPA 86, which requires that all fuel-fired and/or class A process ovens are equipped to provide adequate explosion relief (1ft sq/15 ft cubed oven volume).

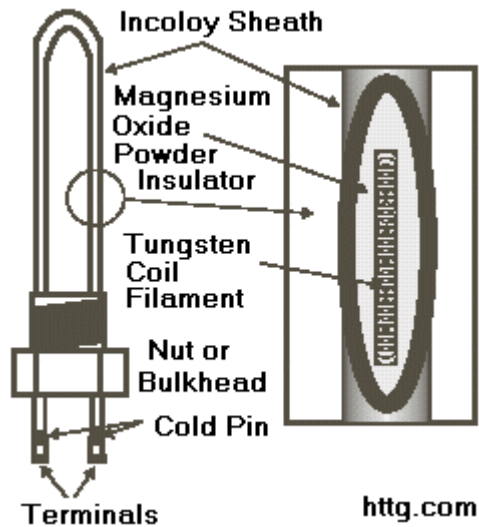
Can you design in explosion venting latches on the doors along with an explosion venting panel in the roof of the unit?

How much heat do you need? It is not as simple as getting some "toaster oven elements", wiring them up and plugging it all in. Figure out your requirements with this equation:

Parts Being Finished =

Work load per hour (lb/hr) × specific heat of the parts (Cp) × the temperature difference between the parts and the solution (in this case air) (F) divided by 3,412 (BtuH/KW).

If you still insist on building your own ovens, then you can find all the heater elements (1,500 watt element for about \$100) you need at: www.InfraredHeaters.com Contact them at 800-442-2581 or sales@heatersplus.com Their helpful staff will be more than happy to help you put together an element and control package.



These are the electrical elements available for use in electrical ovens you can build.

If you need to save money and still get quality parts you need to build a quality oven or purchase a good used oven. By building an oven using the suggestions on the prior pages and incorporating a professional burner box you will have a much better system than one using electrical elements to heat the oven. However, even these ovens can have air issues unless you have first hand knowledge of the baffle design and air flow requirements of your particular oven configuration. Contact JohnsonGas at 800-553-5422 or Lanemark www.Lanemark.com for quality prebuilt burner boxes.



Ovens being fabricated and a pre-built burner box.

Want to be a real powder coater?

Then you need to take this seriously and realize you need professional equipment. Almost 90% of the oven issues our technicians have seen were with novice built ovens (fabricated with insulated steel panels and electrical heat elements – much like your oven at home). Sure your shop can build the best widgets in the industry, but do your engineers understand how to precisely control airflow and velocity? Do they know how to ensure effective heat transfer that ensures accurate and uniform temperatures along and across the parts? If not you are bound to have issues such as discoloration, orange peel and under or over bake problems.

Gas vs. Electric? What should I get?

Gas is significantly less expensive to operate than electric (for both convection and IR ovens). A significant portion of electric energy costs for ovens derive from the monthly demand charges imposed on energy consumed during periods of high demand. For purposes of comparison, analyze the energy costs of an electric system with a demand capacity of 392 kW and a 300 kW average usage level operating eight hours a day, 22 days per month. With these figures, estimated monthly electrical energy cost is \$7,168.24 - of which almost 60% was attributable to demand charges.

Compare these operating costs with those of a 1.6 million BTU/hr. gas system. With the same usage per month, gas charges are estimated at \$1,047.55. The significant savings were possible because there are no utility demand charges for gas usage. Thus, energy-related operating costs for the proposed larger system were estimated at about \$6 per hour vs. almost \$41 per hour for the previous system.

Are you going to run your oven during the day (when demand charges are high) or only on third shift?

Efficiency. Oven efficiency is the ratio of the heat input into the product vs. the energy consumed by the oven. Electric radiant elements typically have a radiant efficiency (the ratio of radiant energy emitted vs. energy consumed) of 60 to 90%. Gas burners typically have radiant efficiencies of 40% to 60%. In each case, the remainder of the energy input (that which is not converted directly to radiation) becomes heated air within the oven.

Engineers design ovens to use this heated air to provide additional heat to the product and offset losses that typically occur through the exhaust and enclosure. The moving air improves overall oven efficiency, ameliorating the inherent radiant inefficiency of gas (when compared to electric). The additional convection heating system supplements the preheated air, helping to heat the poles more rapidly and uniformly than is possible with radiant heating alone.

What about UV and Electron Beam?

UV powders have been available for about 10 years. In fact I was one of the original formulators of UV coatings as they exist today back in the early 1990's. The first successful UV application of powder coatings was by Baldor USA for their electric motors. UV is still however in it's infancy due to the high costs of the curing equipment and powder coatings. It is however an excellent choice for highly heat sensitive substrates such as preassembled parts such as shocks and electric motors as well as for plastics. You can cure a UV powder in as little as one minute!

The following comparison shows how dramatically curing time can be reduced by moving from convection to infrared and finally to UV

curing for a free radical 100% UV solids operation. In one particular analysis, the cost reduction from converting from 100% heating to

100% UV solids resulted in a savings of over \$250,000 per year on electric energy. - (\$/ft²)

Here are some recommended oven manufacturers:

George Koch, Evansville IN 888-873-5624 www.Kochllc.com

East Enterprise Equipment, Lawrenceburg IN 812-539-3820 www.eeecorp.com

Cincinnati Industrial Machinery, Cincinnati OH 513-769-0700 www.canwash.com

ITW BGK, Minneapolis MN 763-784-0466 www.itwbgk.com

Our [Powder 101 CD](#) contains an incredible amount of information, this is just a small portion of the Application section. If you are in the powder coating industry, this program is a must for you.

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