Specifying an Infrared Oven

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Process Heating

Learn what you need to know to get an oven that will effectively handle your range of parts for decades.

There are times when, for your application, one product will stand out above all the rest. After you have seen the tests, you will know if that is the case. If it is, do not worry about whether it is gas or electric powered. Buy the best technology.

The question comes up all the time: What should I watch for when considering the purchase of an infrared oven? There are 10 basic factors to keep in mind. The first five relate to the application and the last five are things that you, the end user of the equipment, should strongly consider when purchasing an infrared oven.

As always, testing is highly recommended to confirm the oven design. After all, you would not buy a house without first looking it over to see if it really is what you need. Likewise, you would not buy a car without first taking it, or a model like it, out for a test drive.

I'll start with what you need to know about your application.

1. Know Your Parts

The ovens supplier will need to know maximum and minimum part size. You should make sure that they test the oven design with these parts. The size of the part is the height, the width and the length of the part. Also, know which are the lightest and th heaviest parts.

Knowing the construction of the parts that will be processed in the oven also is very important in determining the energy densi required to cure or dry your parts. In addition, the infrared oven supplier should know if you plan to "mix and match" differen types of products going through the oven, and whether you can batch, or group, the differently constructed products.

The substrate and coating type also are important. Wood, plastic, composite, steel, aluminum and other materials, or combinatio of substrates, all play a role in determining the best technology for curing or drying your coatings.

2. Know How You'll Load

Several common conveyance methods are available. You will need to alert your oven supplier to the type you plan to use to conve the parts into the oven. Tied closely to this is the conveyor's speed, which often is expressed in feet per minute.

Of course, there also are batch applications, where the parts do not move while they are in the oven. For batch applications, t oven supplier will need to know the size of the batched products and how many batches will be processed each shift.

3. Know Your Coating

This was alluded to in the first tip, but because it is so important, further discussion is necessary. Among the questions you answer about the coating that will be used are the following:

- Is the coating a water- or solvent-based coating?
- Is it an air-dry material that you want to force dry?
- Is it a plural-component coating?
- Is it a baking enamel? If so, is it a high- or low-bake coating?
- Is the coating a powder?

You also should be ready to share the coating's curing parameters, which the coating supplier can provide. For example, what temperature is needed to cure the coating? Does it require flash time? If so, how much flash time is required?

4. Know Your Schedule

Sometimes, it is difficult to know your production schedule at the point at which you are specifying your oven, but it is important because it will be a significant deciding point when determining which type of infrared oven will best suit your application. Production schedule refers to how many shifts per day will be processing parts through the oven, and how many hours or minutes per shift the oven actually will be processing parts. Some applications run three shifts per day with line density to its maxim and the conveyor rarely stops. Other applications run less than one shift per day with frequent starts and stops.

5. Know Your Budget

This probably should have been Tip 1, but I did not want to scare you off. You can save yourself and the infrared oven supplier hours of time by knowing how much you can spend on the oven component of your finishing system.

Once your budget is set and you are comparing proposals, make sure that when comparing different types of ovens -- infrared vs. convection, electric vs. gas, and so forth -- that you look at the oven as an installed component. Most (but not all) infrared ovens are prebuilt at the oven manufacturer's facility. This greatly reduces installation time and costs. In addition, if the infrared oven's control cabinet can be preinstalled on the oven at the time of manufacture, more money can be saved on installation costs. Evaluating systems based on installed price allows you to compare a complete accounting of costs for the systems being considered.

Having looked at the things you should know and tell the oven supplier about your application, I will now look at things you should consider when purchasing an infrared oven.

6. Buy What Suits You

The question, "Should I buy a gas-powered or electric-powered infrared oven?" is one that always comes up. It's a difficult question. The "correct" answer depends on the variables specific to your plant, process and application, such as the planned production time and rate; the cost of gas and electricity for your plant; the availability of gas or electricity; and coating a substrate limitations. There is no one right answer -- there is only the right answer for your specific circumstances.

Using average energy costs, it generally takes three shift years to pay off the cost difference between a gas infrared oven and an electric infrared oven. That generality being said, across our world, energy costs are all over the place. The best way to know if you should be purchasing an electric or gas infrared oven is to run a return on investment scenario on the ovens quoted to you. You infrared oven supplier should be able to help you do that.

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Lastly, before deciding upon a gas or electric infrared oven, make sure you have the proper utilities. If you do not have gas service available, an electric oven may be your only option. Conversely, if you do not have sufficient electrical service available, and the cost to run a new service into the building can be quite expensive, a gas infrared oven may be your only choice.

7. Save Floor Space

An infrared oven will use 10 percent to 30 percent of the floor space required by a convection oven. In some applications, an infrared oven can cure the coating in seconds, so floor space can be greatly reduced. If you run out of floor space, consider elevating the oven. Most infrared systems are light enough that they can be supported from the ceiling or placed on a mezzanine

8. Watch the Exhaust

Except in some preheating applications, all infrared ovens need exhaust ducts that vent gases run to the outside of the buildin Sometimes, your infrared oven supplier can get that down to one building penetration, but occasionally it has to be more. Work with your supplier to make sure you have enough exhaust, especially in powder applications. Do not take for granted that a fan at the end of an oven is sufficient to remove all of the smoke generated by some powders. This is another good reason to see the oven designed for you in operation during testing.

9. Don’t Skimp on Control

An infrared oven offers a distinct advantage over a convection oven, and that is temperature control. Temperature control is achieved by blending and maximizing temperature zones and recirculation air usage.

Zoning is controlling the amount of energy produced in various sections of the oven. The best infrared ovens offer zoning from top to bottom so that you can control the temperature over the height of the parts. A three-zone oven may have one zone along the top rows of infrared emitters; a second zone comprising the middle rows of infrared emitters; and a third zone controlling the bottom rows of infrared emitters. In addition, some infrared ovens can be zoned by length.

The addition of recirculation air can help to cool hot areas and keep parts from overheating in the case of a line stoppage.

10. Watch the Energy Density

Each infrared oven is designed around your parts and coatings with a desired range of energy density. Energy density is the amount of energy you apply to the curing chamber and generally is expressed in BTU per cubic foot (BTU/ft). An oven with too little energy density will not get your parts hot enough in the time allotted to the curing process. An oven with too great an energy density will not allow you to keep sensitive parts cool enough, especially when the production line stops.

In conclusion, in the perfect world of the oven manufacturer, all of your parts would be of the same material and always facing the correct direction. In the end-user’s perfect world, the oven should morph into any configuration needed to cure parts using the least amount of energy required. It is safe to say that we do not live in a perfect world. Versatility costs money, efficiency is relative, and sometimes it is difficult to do what we want to do. The good news is that by being aware of the information that the infrared oven supplier needs from you and by knowing what features are available, you can expect to purchase an infrared oven that will properly process the full range of parts you coat and provide well-cured parts at a reasonable cost for decades.

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