

5 General Oven Design & Operation

There are some general rules that govern standard good practice in the design and operation of process ovens. Observation of these rules will help a powder coater acquire and maintain a dependable oven.

Oven Cleaning

Oven maintenance is a critical issue in the design. It will be necessary to clean the inside of the oven, so you must have accessibility to the duct, inside and outside and the surfaces should be smooth so that they can be washed or vacuumed. Oven interiors should be cleaned once a week to prevent an accumulation of dirt from building up.

Safety

Explosion relief panels should approach a vent ratio of 1 square foot for every 15 cubic feet of oven volume. They should be installed in the oven roof or similar non-personnel area.

Oven burners are equipped with safety devices to prevent any problem associated with the gas. These safety devices should be tested twice a year to be sure that they are in proper working condition.

Oven exhaust must be suitably sized to remove the gases that are a natural by-product of the cure process.

Training, Maintenance, and Inspection

Train operators in the proper operation of the oven or dryer, and in the specific functions of the various safety controls. Operating instructions should be posted or kept available for ready reference.

Automatic safety controls furnish only partial protection against fire and explosion. The operators must carry out the vital precautions.

Maintain all equipment in good condition.

Safety controls require regular maintenance in accordance with the manufacturer's instructions, and should be inspected and tested periodically. Failure to do this may result not only in fire or explosion damage and personnel injury, but contribute to accidental shutdowns and loss of production.

Shutoff valves, interlocks, and other safety controls may malfunction without the operator's knowledge, unless the faulty controls cause nuisance shutdowns. Operators concerned with production may even bypass a faulty safety control without reporting the trouble.

Inspect and test safety controls periodically. Personnel who are familiar with the equipment and specific functions of the various controls should make the tests. It is usually better to have maintenance personnel rather than the regular oven operators, make inspections and tests.

Suggested Inspection Schedule

Weekly:

1. Flame failure detection system.
2. Ignitor and burner operation.
3. Combustible gas analysis and automatic interlocks.

Monthly:

1. Fuel safety shutoff valve(s) for leakage.
2. Fan and airflow interlocks.
3. Time delay switches.
4. Conveyor interlocks.
5. High temperature limit switch.
6. Door and damper limit switches.
7. Explosion venting latches.
8. For oil: (a) Fuel pressure and temperature interlocks.
(b) Atomizing media interlocks.
For gas: (a) Gas cleaner and drip leg.
(b) High and low fuel pressure interlocks.

Semiannually or annually, (as required):

1. Ignition and burner components.
2. Combustion air supply system.
3. Flame failure system components.
4. Piping, wiring, and connections of all interlocks and shutoff valves.
5. Combustion control system.
6. Calibration of indication and recording instruments.

7. Automatic fire checks.
8. Operating sequence tests, all components.

Purge

A purge of four times the oven volume is required for any oven prior to firing the burner. Since the purge cycle is typically around 30 minutes, it may be desirable to add a second exhaust to purge the oven at a much faster rate. If start up requires a short purge cycle, this should be part of the design. The recirculation fan can be used to accelerate the purge by switching a damper and dumping the fan air to atmosphere instead of into the oven. When the purge cycle is complete, the damper is switched back to recirculation.

Mounting an Oven

Ovens can be mounted on the floor, on a raised platform within the building, or on the rooftop. Where to mount it is a balance of economics and space considerations.

A floor-mounted oven does not require a severe change in elevation, it is easy to service and it is the least expensive way to install. An oven mounted on an elevated platform within the building saves floor space and it may be high enough to provide a bottom entry/exit to the oven. The floor space can be used for storage of product or other items. The bottom entry will provide excellent heat containment.

A roof mounted oven removes the process heat from the building provides a bottom entry and saves floor space. An elevated oven can cost considerably more than a floor mounted oven due to higher installation costs.

Return Air Filtration

Ovens are a source of dirt that can wind up on the product. Vacuuming the oven interior weekly will help to prevent contamination in the oven from building up and becoming a problem.

Another way to help avoid an oven dirt problem is return air filtration. A filter framework is built into the return air opening of the burner box. A row of 30% efficient filters acts as the first layer with a secondary layer of 90% plus efficient filters. This prevents the blower from circulating dirt onto the parts and maintains a constant sweeping action.

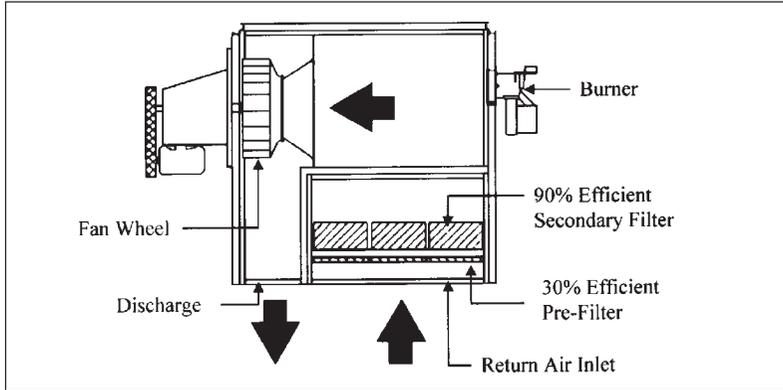


Figure 5-8 - Return Air Filtration