

How To Safely Start Up a Combustion System

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Most oven explosions occur due to a failure of at least three or more components of a safety system. Included in the components of the system are the electromechanical and electronic controls or limits, and the human interface. The human interface can involve not only the actual operator of the equipment, but also those that were involved in the design and construction. As the operator of an oven, furnace or kiln that has shut down, the most important thing to do is not become the last item in a string of failures that will cause an unscheduled oven or furnace incident or explosion. In the end, it is the person who takes the final action of pushing the button to start the equipment who is responsible for ensuring that all of the controls installed to provide a safe operating environment are in good operating condition. The operator should know how the equipment operates and why the controls function the way they do.

When a lockout on safety occurs, the flame safeguard control often is seen as the problem because most often it generates the alarm signal. There are two sides to every control: the input and the output. The actual problem could be any device in the control system.

On the input side are the limits, which indicate a call for heat and that all conditions are or are not in the proper state to operate the system. Included in the limits may be the temperature operating control, temperature high limit control, high and low gas pressure, and fan switches, to name the more common devices. The input side also may include a lockout circuit that, when interrupted, will cause the flame safeguard control to lockout immediately and signal an alarm. In the lockout circuits may be combustion air fan and pressure switches and a separate circuit to indicate the gas valves are proved closed. Any or all of the devices in the circuit could be a manual reset device, depending on the code, user, application and OEM requirements.

The last item to mention on the input side is the flame-sensing device. Flamerods, UV and infrared detectors all sense flame through current measurement; however, the similarities end there. Replacing the flame sensor may not solve the problem.

The flame safeguard control outputs are the pilot and main fuel valves, the ignition transformer, and may include the output to start the combustion air fans. The failure of any one of these devices may cause a safety shutdown.

Sidebar: How-to Checklist

Items to know before starting up the combustion equipment.

- Know and understand the equipment. It is the original equipment manufacturer's responsibility to provide the operator's manual for the equipment. It is the user's responsibility to read and understand the manual before operating the equipment.
- Understand the safety equipment and how it will shut the system down. What do the lights on the panel mean? Where is the emergency shutdown button? Which controls require manual reset and which reset automatically?
- If the equipment has shutdown unexpectedly or a lockout condition has occurred, determine which device caused it, then check the other safety devices in the system. Perform a visual inspection to ensure the devices are in good working order and that no one has violated the integrity of any device -- for example, by installing

a jumper wire across the terminals of a control or limit.

- Perform a visual inspection of the fuel valves to make sure they are in the proper position.
- Once you are satisfied the safety controls are in good working condition, be make sure all personnel and equipment are clear of the area.
- Once it is determined it is safe to start, push the start button. One last item of information. Some systems have an electromechanical purge timer. Never adjust the timer down below the manufacturer's setpoint. Wait the full time before allowing for ignition, no matter how long it seems to take. The purge timer allows for the equipment fans(s) to remove combustible fumes and gases to prevent an explosion.
- During operation, monitor the equipment to ensure the system is functioning properly.