Technical Reports

Understanding Your Gas Burner Components

Before ignition of your gas burner takes place a series circuit has to be completed. The series circuit consists of interlocks, pressure switches and contacts. As these connections close and power flows through them, a series of lights will appear on the equipment sequence monitor located on the motor control panel. These lights are numbered 1 through 18 and labeled as to their function and sequence of operation. This is also indicated on motor control electrical drawing. When this circuit is complete, one side of the flame relay is powered in the combustion safeguard unit (Barber Colman or Fireye). When the flame rod or ultraviolet eye detects pilot light the flame relay is energized powering safety gas valves permitting the main burner to be fired.

Components & Definitions

**Air Flow Switch** - Pressure activated devices arranged to effect a safety shutdown or to prevent the burner from starting in the event the main blower (fan) is not running for purpose of purging oven and proper combustion (air and gas ratio).

**Combustion Air Pressure Switch** - Pressure activated devices arranged to effect a safety shutdown or to prevent the burner from starting in the event the combustion air supplied to the burner falls below that recommended by the burner and manufacturer.

**Prove Oven Door Open/Prove Fresh Air Intake (FAI) Damper Oven/Prove Exhaust Damper Open** - A three (3) minute minimum purge cycle is required prior to pilot ignition. These are microswitch interlocks.

**Prove Safety Valve Closed** - Inside the two fluid power gas valve actuators there is a microswitch interlock that closes and indicates that the valve is closed.

**Low Gas Pressure Switch** - A pressure activated device arranged to effect a satisfactory shutdown of the burner to prevent the burner from starting in the event of abnormally low gas pressure. The attention of an operator shall be required before re-start.

**High Gas Pressure Switch** - A pressure activated device arranged to effect a safety shutdown of the burner from starting in the event of abnormally high gas pressures. The attention of an operator shall be required before re-start.

**Prove Low Fire Start** - A microswitch interlock on linkage rod arm of gas burner proving that burner in low fire start position prior to ignition start.

**High Temperature Limit** - Limit switch in supply air discharge. Normally set between 350°F and 550°F depending on location of limit switch, size of burner, CFM of main blower (fan).
**Purge Timer** - This timer is a fixed four-minute timer for ventilation is required for initial lighting or relighting of oven since fuel may accumulate during a shutdown period.

**Ignition of Pilot Cut-Off Timer** - This timer is set for maximum of 15 seconds. If pilot light is not proven before this time system will return to purge cycle (3-minute minimum).

**Combustion Safeguard** - The term Combustion safeguard except where supplemented by the words Agas-analyzer type, means a safety control responsive directly to flame properties; it senses the presence of flame and causes fuel to be shut off in event of flame failure.

This device in its simplest form, often called non-programming, comprises a flame-detecting assembly and one or more safety-control circuit so that during lighting-off, it must prove the presence of the pilot flame at a location where the pilot will reliably ignite the main burner before permitting the main fuel safety shut-off valve to be energized and opened. During firing, it supervised the main flame alone or the pilot and main flames simultaneously. In event of accidental flame failure during firing, it causes all fuel to be shut off and the electric ignition to be deactivated. The attention of an operator is necessary before the next pilot-flame establishing period of trial-for-ignition can start. Because of this operating characteristic, a non-programming combustion safeguard is often further classified as non-recycling.

This device is also available in a more complex form, often called programming, which is the same as the non-programming except that it has an ignition-timing assembly as well as a flame-detecting assembly.

Approved combustion safeguards, either programming or non-programming, have a flame failure response time of not more than 4 seconds. Also, they may have a flame failure contact that can be wired into flame failure alarm and signal circuits. They usually have a built-in safe-start check, a safety feature that prevents lighting-off if the flame-sensing relay is in that the unsafe flame present) position due to component failure within the combustion safeguard or to the presence of actual or simulated flame.

**Pilot** - A reliable ignition source for the main burner is one of the best safety controls. Properly constructed pilot burners of adequate capacity and properly located to insure ignition of the main burner reduces the hazard associated with the burning of fuel.

**Oven Exhaust System** - The need for an oven's exhaust stack for removal of products of combustion.