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82060 Trinity Flame Proving Circuit Operation

Model Numbers: T150 - 200

Trinity Flame Proving Circuit Operation

Operation:

The flame proving circuit consists of the Fenwal controller, a wire, the flame probe, the flame, and electrical ground (surface of the burner) all connected in series. The Fenwal control applies an AC voltage potential to this circuit; the flame completes this circuit by allowing the positive portion (or "DC equivalent" portion) of the AC signal, to flow DC current to electrical ground (surface of the burner). The Fenwal measures this DC-current flow and if it is high enough (more then 0.6micro Amps) the Fenwal will allow the burner to continue operating.

The magnitude of the DC current (or strength of the "flame signal") depends on the intensity and size of the flame, and the positioning of the flame probe in the flame. Since the Trinity is a modulating boiler the size of the flame changes throughout the modulating range, therefore it is important to verify that a strong flame signal (2.5micro Amps and higher) is present at low fire and high fire. Also, since the flame intensity depends on the combustion characteristics, it is important that the combustion is checked with an analyzer at maximum and minimum firing rates.

Flame Probe Shorting to Ground:

A third factor contributing to the strength of the "flame signal" is the amount of AC-current that is leaking to electrical ground and thus diminishing the magnitude of the DC-current flowing through the flame. This leakage is always present at some level; however, if it is high enough the DC-current flow will reduce to a value below the minimum 0.6μA required by the Fenwal control. If the "flame signal" is strong during ideal conditions, it will take more leakage to lower the DC-current flow to the minimum level.

The electrical leakage generally transpires through a medium electrically connecting the conductive portion of the flame probe and electrical ground. Ideally this medium consists of "flawless" ceramic flame-probe insulation and dry air, which would result in minimal leakage. Alternatively the medium may consist of "flawed" ceramic flame-probe insulation, damp air, or damp refractory particles, which would result in excessive levels of leakage.

Prevention:

To minimize the magnitude and the effect of AC-current leakage, the following precautions shall be taken during boiler set-up:

1. Check, and if necessary, adjust combustion to the proper level. Proper combustion should be obtainable at maximum and minimum firing rates, if not contact NTI. (Note: colder combustion air temperatures will result in lower CO_2 levels, therefore, on the coldest days the CO_2 should be at the lower end of the acceptable range.)

2. Check flame signal strength at maximum and minimum firing rates. If the signal is lower then 2.5µA at either rate, change the position of the flame probe relative to the flame by removing the flame probe and bending as shown in the figure. When bending of the flame probe is required, start by bending it 1/8" further away from the flame.
3. Ensure the heat exchanger is installed level or slightly sloping toward the condensate drain. Also ensure the condensate drain is free flowing. If the condensate drain becomes plugged, moisture will build-up in the heat exchanger causing a direct short to ground.
4. Under many operating conditions the combustion chamber will become humid. To reduce the likelihood of increased AC-current leakage, remove the cement from the base of the flame probe, if it exists, and ensure the flame probe hole is free of debris, which will contribute to the likelihood of leakage.