ONWATCH® On The Job
Number 12

Perennial Gas Problem

In 1998 a well-established mechanical contractor installed two Weil-McLain 12-section boilers in a high school. Since then, one of the two boilers has repeatedly gone to safety lockout. After resetting, it operates perfectly. These are equipped with Power Flame CR4-6-2S burners and Honeywell 7800 series controllers. Various components have been replaced and factory reps from all the involved companies have been to the site but the failures have continued. The contractor estimates this problem has cost them more than $6,000 in non-reimbursed time.

Recently the company purchased an OnWatch Model 51 and, after a little thought to adapt, utilized it to "camp out next to the burner." Some of the components of the Model 51 are designed for 24-volt circuits, not the 120-volt that is common on commercial units. The adaptation is easy, however, by using 24-volt transformers to step down the voltage. Because transformers are linear, by taking a voltage coming out of the transformer and comparing it to the line voltage, it is easy to determine any other voltage.

Because no one knew what component was causing the failures, the diagnosis was a three step process. "After all this time," the service manager said, "any information is welcome."

The first step was to monitor as many different components as possible. The Model 53 Interface was connected as follows:

- Calls for heat from the aquastat (120-volts stepped down to 24-volts) using the red wire;
- Presence of voltage going to the pilot valve using the blue wire;
- Pilot valve outlet gas pressure;
- Amperage on the transformer primary lead;
- Voltage going to the main gas valve (120-volts stepped down to 24-volts) using the red wire;
- Main gas valve outlet pressure;
- Stack temperature.

The easiest way to diagnose a problem is to compare the data from a "normal burner run" with the failing run. A typical start up was as follows:

[NOTE: Column headings have been changed to show what was actually recorded and also repeated data during pre-purge has been omitted.]

SET: 186 Start Time: 06:18:48 Start Date: 10/29/2001
Recording Mode: Gas

Elapsed	AQ	MGV	TEMP	PILOT PRESS.	MGV PRESS.	PILOT VOLT Y/N	XFRMR AMPS	Event
00:00:06	ON	OFF	160	0.0	0.0	N	<0.1	Sample
00:00:10	ON	OFF	159	0.0	0.0	N	<0.1	Sample
.	.	.	.	.	.	.	.	.
			[Pre-purge]					
.	.	.	.	.	.	.	.	.
00:01:31	ON	OFF	143	0.0	0.0	N	<0.1	Sample
00:01:36	ON	OFF	142	2.0	0.0	Y	1.0	[Voltage to pilot valve & amps draw by transformer]
00:01:41	ON	OFF	141	2.0	0.0	Y	0.9	Sample
00:01:44	ON	26.4	141	2.1	0.0	Y	1.0	MGV Volts On

On the 192 start up, the failure occurred. The data showed:

SET: 192 Start Time: 07:30:25 Start Date: 10/29/2001
Recording Mode: Gas

Elapsed	AQ	MGV	TEMP	PILOT PRESS.	MGV PRESS.	PILOT VOLT Y/N	XFRMR AMPS	Event
00:00:06	ON	OFF	132	0.0	0.0	N	<0.1	Sample
00:00:11	ON	OFF	131	0.0	0.0	N	<0.1	Sample
.	.	.	.	.	.	.	.	.
			[Pre-purge]					
.	.	.	.	.	.	.	.	.
00:01:31	ON	OFF	128	0.0	0.0	N	<0.1	Sample
00:01:36	ON	OFF	128	2.0	0.0	Y	<0.1	[Voltage to pilot valve but no amps to transformer]
00:01:41	ON	OFF	128	1.9	0.0	Y	<0.1	Sample
00:01:46	ON	OFF	128	0.0	0.0	N	<0.1	Ignition failure. Shutdown.

Analysis

On the 192nd call for heat since the OnWatch was installed, pre-purge ran normally. At 1:31 minutes, elapsed time, the ignition sequence started. Voltage went to the pilot valve and the outlet gas pressure was normal but no amperage was recorded on the primary wire going to the transformer. The ignition failed after approximately 10 seconds. Now we knew that the failure was caused during the transformer function in igniting the pilot flame. The next step was to determine if it is a control module failure (the relay not sending voltage to the transformer) or is it a fault downstream at the transformer/electrodes. We needed to know which was causing the failures.

STEP TWO

In order to "surround" the transformer circuit with the OnWatch Model 51, some quick wiring changes were made.

This time the OnWatch was connected as follows:

- Calls for heat from the aquastat (120-volts stepped down to 24-volts) using the red wire;
- Voltage on the transformer primary lead (120-volts stepped down to 24-volts) using the yellow wire;
- Amperage on the transformer primary lead;
- Pilot valve outlet gas pressure;
- Presence of voltage going to the main gas valve using the blue wire;
- Main gas valve outlet pressure; and
- Stack temperature

By monitoring both the voltage and amperage on the transformer primary lead, we would learn if the problem component was the control module not sending voltage to the transformer or was the transformer/electrode assembly not sparking.

The next time the burner locked out it showed that there was 118 volts on the primary wire to the transformer but still <0.1 amps.

Analysis The transformer/electrode assembly was not sparking. The electrodes were not grounding out because there was no amperage draw. There simply was not a spark being formed. Since the transformer had been replaced earlier, it was decided to replace the electrode assembly. That was it. The burner did not lock out again.

After more than two years of frustration, the faulty component was detected.

Systems with 120-volt Control Circuits and Valves

The OnWatch Model 53 Interface is designed for 24-volt circuits. To use on 120-volt circuits, simply place 120- to 24-volt transformers on those circuits and connect the output of the transformer to the Model 53 Interface.