fireright

Troubleshooting Help for

AutoMate II Kiln Control Systems

When kiln controls are completely inoperative or obviously damaged, troubleshooting is easy. More often, the problem is not so obvious. A very common complaint is that the kiln is unusually slow, or fails to reach the needed temperature. Then diagnosing the situation is not quite so easy, because there are several things that can cause the problem. Here's how you can methodically work through the possibilities to find out what's going on.

Check the AutoMate II

To test the AutoMate II, engage the KilnSitter's latching mechanism to make power available to the system, then turn on the AutoMate II, moving the knob all the way to the **SET** position and leave it there. Within ten seconds or so, the **HEATING** light should flash once. After that, it'll flash again at ten-second intervals, the duration of its *ON* time increasing about 10% with each cycle, until after the tenth flash it will remain on permanently. Several seconds later, the **TIMING** light will turn off, and will remain off. If this doesn't happen, the AutoMate II is probably faulty, and should be sent in for repair.

Each time the **HEATING** light flashes on and off, you should be able to hear power being applied to the kiln's heating elements. If the kiln has a mechanical power relay, you'll heat it click on and off. Kiln manufacturers sometimes used mercury-type power relays, which operate silently, but if the room is quiet, you'll still be able to hear the heating elements "sing" when power is applied during those times while the **HEATING** light is on.

If this doesn't happen, there might be a problem with the heating relay, or the wiring between the AutoMate II and the heating relay. A visual inspection is usually successful in discovering loose or disconnected wiring, and over-heated or burned out power relays.

If the wiring looks okay and the large power relay appears to be serviceable, the small relay on the AutoMate II might be sticking or fouled with a small particle that prevents it from making contact. This can sometimes happen intermittently, in which case a firing might begin normally, but the stop abruptly before the scheduled time. If the **HEATING** light is on, but the kiln’s heaters are off, try giving the AutoMate II panel a rather solid wrap with the heal of your hand. If that results in the kiln’s heaters lighting up, a sticking relay is strongly indicated. Disconnect the AutoMate II panel and return it for repair.

Check the Heating Elements

After the **HEATING** light reaches the 100% *ON* status in the above run-up, *while the kiln is still cold* lift the kiln's cover and observe the heating elements as they begin to turn red. An element that fails to light up is probably burned out, although such problems also sometimes result from corroded electrical connections. Inoperative elements will prevent the kiln from achieving higher heats, so will need your electrician's attention.

Check the Electrical Service

If all the heating elements appear to be good, the next question is the electrical service itself. The kiln is probably wired for 220-240-volts. Overloaded electrical systems, bad circuit breakers, loose connections, and undersized wiring often result in lower voltages at the kiln, preventing it from reaching higher heats. Your electrician can easily check this out, if needed. Before making the measurement, turn the kiln full on, allow the elements to heat up somewhat, then make the measurement at the kiln itself at some point within the kiln’s switch box. If the voltage at the kiln is much lower than the service's rated voltage, the electrician will be able to work backwards, taking measurement progressively further back toward the power source to see where the problem (a voltage drop) is developing.

Got the Right Heating Elements?

Electric kilns are most commonly designed for 220/240-volt single-phase power. An older standard provides 208-volts, and large kilns are

sometimes designed for three-phase power systems. The heating elements in your kiln must match the line power of your electrical service. A rather common error is to replace the elements in a kiln designed for 208-volt systems with elements calibrated for a 220/240-volt kiln. The result is essentially the same as low line voltage, with the kiln failing to achieve higher heats in a reasonable time, or at all.

About Pyrometric Cones

Pyrometric cones respond, generally, to heat and time, not really to temperature *per se*. The temperature charts for cones refer to conditions where the temperature is rising steadily at a carefully controlled rate (e.g., 270-deg F per hour.) That situation rarely occurs in practical ceramic kilns, so kiln firing is an art, rather than a science, and consistent success comes with experience, rather than from closely following instructions. Cones are useful for gauging firings because they reflect what's actually going on with the ware being fired, which responds to time and temperature is a similar way. Cones (and glazes) will mature well below their rated temperature if left soaking long enough at a lower temperature. When over-firings occur, judging from the disastrous melt-down, people often assume that the temperature in the kiln must have reached several thousands of degrees, however that is never the case because electric kilns are never able to produce temperatures much higher than 2450-deg F. The catastrophic damage is merely the result of the kiln and the ware inside being exposed to high heat for an excessive amount of time.

Understanding the AutoMate II

The AutoMate II is simply a kiln switch that turns itself up. Older kilns had "switch schedules" requiring the operator to begin by setting the individual manual switches for each heating element at "low," then returning a couple hours later to turn them up somewhat, then returning again perhaps three or four hours later to turn them all on "high." The AutoMate II turns the kiln up automatically, and in a linear manner, by switching the elements on and off at regular intervals, gradually increasing the duration of the "on" time until it reaches "100%." It then maintains that level indefinitely. In most cases, "indefinitely" ends when the KilnSitter trips the kiln off. That should happen when the cone in the KilnSitter's tripper mechanism bends. If that happens only after the KilnSitter's back-up timer finally times out, or when you manually trip it off, the kiln's heating process is evidently stalling out well below its rated capacity.

When the AutoMate II is turned on and set at **4**, it will turn the kiln up from 0% *ON* to 100% *ON* in four hours. With the knob moved to the **SET** position, its timing mechanism is bypassed, and it turns itself up at a rate of about 1% per second. Thus, for each 10-second click, the kiln is turned up about 10% ... three click equals about 30%.

People sometimes prefer to start a firing by moving the knob to the **SET** position and presetting the kiln to 10%, 20% or whatever, because the AutoMate II otherwise begins at 0%, and for several minutes there will be no indication whatsoever that anything is happening.

Others, especially those working with heavy, moist, hand-built things, run the kiln up to 20% or 30%, then move the knob to **HOLD** in order to keep the kiln at a low temperature while the moisture vaporizes out of the ware. They then eventually return, move the knob to **4** or whatever number of hours they feel will be appropriate for the rest of the firing, whereupon the AutoMate II automatically resumes the turn-up process and the firing completes in the normal course.

Depending upon what you're firing, glaze firings are usually not very critical and do not require "smoke outs" or slow firing. So you could simply set up the KilnSitter, engage its plunger, turn the AutoMate II on moving the knob to **4** (or whatever turn-up time you feel is appropriate), then walk away. Several minutes later you would observe that the firing sequence had begun. If you are using a low cone number in the Sitter, it'll probably trip the kiln off before the AutoMate II reaches the 100% *ON* point. On the other hand, if using a higher cone number, the AutoMate II will bring the kiln gradually up to 100% during the time you set, and some time later the cone in the Sitter will bend, tripping the kiln off, thus completing of the firing.

More Help

Electric kilns are simple systems, so most problems are easy to diagnose. A sometimes complicating factor arises from the fact that the firing process is very slow, and problems occasionally happen during times while nobody is actually watching the kiln.

Effective troubleshooting involves starting at the logical beginning of a system (in this case the kiln’s controls) and working methodically through it to the other end (the electric service.) With this approach, you are very likely to be able to discover the cause of your kiln’s problems. Random guessing is almost always ineffective, and costly in terms of both time and money.

If you need additional advice or service assistance, you’ll find additional resources and contact information on the FireRight website.

FireRight Controls / Warner Instruments
1320 Fulton Avenue
Grand Haven, Michigan 49417-1534 USA
Phone: (616) 843-5342
web: www.fireright.com

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