SKUTT

Troubleshooting

You've been experiencing firing defects and can't seem to find the cause. Is it the glaze or the bisque? Maybe it's the application. Or could it be the kiln? Of all these variables, sometimes the easiest to troubleshoot is the kiln. You can take all of the other variables out of the equation, and if the kiln properly bends cones, chances are it's working correctly.

The key to effective and efficient troubleshooting is following a logical process. A troubleshooting process helps keep you focused and moving forward toward a solution. Most of us have a tendency to point the finger of blame at the kiln first. However, most firing problems are the result of human error. Unless the source of the problem is obvious, it makes sense to start the troubleshooting process by taking a quick look at some key variables that might have been over-looked. Asking some basic questions can help you determine whether a kiln problem exists when it might not be obvious.

Was the Program Input Correctly?

Nearly all controllers have a review feature that allows you to examine the last program input. Re-examine the program to make sure it is the one you intended to run and corresponds to the load you have in the kiln. Some common mistakes that are easy to make include forgetting the leading "0" on a low fire bisque program entering Cone 6 instead of 06) or entering hold times in hours instead of minutes.

Another common mistake is a miscalculation of heat work when using the ramp and hold programming mode found on most controllers. This mode allows you to enter a custom firing program. However, the trick is getting the peak temperature correct.

All of the published cone temperatures for the Orton Ceramic Foundation's cones, for example, correspond to a particular firing rate during the last 100°F of the firing. (Orton cones are the most commonly used pyrometric cones.) The most commonly used shutoff temperatures are the values associated with 108°F per hour. Therefore, for a temperature to be valid, the kiln must be firing at 108°F per hour during the last 100 degrees.

Cone simulation programming modes are common on many controllers and are generally referred to as "cone fire mode." When using this mode, the controller is programmed to automatically compensate for a fast or slow-firing kiln by adjusting the final temperature up or down—that is, the longer the kiln takes to fire through the last 100°F of the program, the lower the ending temperature should be, and vice-versa. Ramp and hold programs do not compensate for this effect, so you must know your kiln's firing rate capabilities through this final heating segment and program the correct ending temperature. If you use a 108°F per hour cone value and your kiln slows to 50°F per hour during the final segment, it will receive too much heat work.

Other factors—particularly the size of the load, low voltage, and the condition of the elements—can also affect the firing rate through this critical point in the firing process. All three of these variables can be measured to determine whether they are the source of the problem.

WHAT DO THE CONES SAY?

After you have determined that your program is correct, you should next look at your self supporting pyrometric cones. If the cones are bending correctly and your ware is not coming out right, chances are the problem is not with the kiln.

When you are examining the cones, try not to be too critical. Generally a cone bend between 45 and 90° is right on the money. Only a slight difference in heat work exists between the two bends. If you haven't been using cones, run a test fire using cones. Be sure to use self-supporting cones whenever possible—cones designed to be placed in pads of clay need to be set at just the right angle and depth to give you an accurate reading.

You can learn a lot from cones even if you only use a single cone in the kiln once a week. By tracking how your cones are bending over a period of time, you can identify trends and address problems before they become serious. Use a number of cones at different levels of the kiln. This will help you determine whether the kiln is firing evenly from top to bottom. Try to roughly simulate the density of the load by using shelves posted in the chamber. Always place one cone about 2 in. from the thermocouple.

When you run the test, use a cone fire mode programmed to the cone value that you fired to previously. If the cones look good, then the kiln is probably OK and you will have to look elsewhere for the source of the problem. Cones that are over or under-fired might indicate a kiln problem…but one more question still needs to be answered before you start tearing your kiln apart.

WHAT HAS CHANGED?

One of the last steps in troubleshooting your kiln is to analyze what has changed since your last successful firing. If things have been going well and suddenly you experience problems, something has changed, and often it is not the kiln.
Look at things such as:

Have you changed suppliers?

If you have recently changed suppliers for one or more of your raw materials, the composition of those materials is likely to be different and may be causing your firing problems.

Is a new person programming the kiln?

If so, the program may have been entered incorrectly.

Has the kiln been moved?

Kilns must often be disassembled into components when they are moved, and sometimes they are not reassembled correctly.

Has the kiln been worked on?

Kilns are unique instruments and can be some-what complicated to repair. If you are not com-pletely confident your kiln was repaired correctly, have someone else inspect the repair.

Was the last firing at the same time of day?

In some areas, the voltage can change at certain times of the day. For example, voltage often drops significantly on hot summer days when demand for air conditioning is at its peak. Lower voltage means a longer firing time and can sometimes prevent the kiln from reaching the correct temperature.

Have any of your glazes or clay body formulations been altered?

Sometimes even minor changes can cause major problems.

Have you changed the way you load the kiln?

Uneven distribution of mass within the kiln can cause the kiln to fire unevenly.

ISOLATING THE PROBLEM

If after this analysis you still cannot get the cones to bend correctly and all of the other variables have been absolved of any wrongdoing, the problem is probably associated with a failed component. But there are also appropriate troubleshooting processes for isolating the problem with the kiln. The kiln manufacturer is often a good source for information on efficiently isolating and repairing kiln problems. Check the kiln manual and the manufacturer's web site for information before you begin. And above all, be safe. Below is a simple test for checking your relays and elements

How can I check a KM kiln for proper operation?

One simple and quick test to determine that the relays and elements are working correctly is to visually inspect the kilns heating elements while the kiln is on. You can do this by running a single segment Ramp/Hold program to 500 F in an empty kiln and running it with the lid open so you can see the elements glowing. It will usually take anywhere from 10 to 30 minutes to see the elements glow depending on the model of the kiln and the age of the elements. While looking at the elements you might notice the following:

- **One section of the kiln is not going on. This indicates a defective relay that is not turning on. There is usually one relay per section**
- **One element is not glowing at all. This indicates a broken element.**
- **There appears to be cool spots on some elements. This indicates worn elements.**
- **The TOP and BOTTOM elements are hotter than the center elements. This is normal for all KM model kilns except the KM714, and the KM614.**