

It's About Time PLUS Temperature

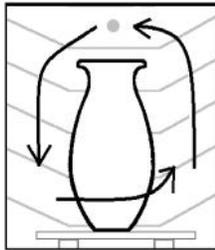
Heatwork, or getting the heat's full effect on the clay, is not just a matter of reaching the optimum temperature – even with computerized kilns. Heatwork is a combination of time and temperature. It takes a certain amount of time at peak temperature for clay to achieve complete maturity. Compare it baking a cake in your oven: just because the temperature reaches 350° does not mean the cake is done. It takes time for the heat to do its work on the batter. Heatwork is also cumulative for clay.

That's Why We Recommend Witness Cones

As clay artists we depend on our kilns to give us repeatable, reliable firings that show off our work to the best of our ability not just one time, but all the time. In all kilns, variations in temperature can and will occur. There can be hot spots or cool spots, and those variations persist even up to peak temperatures when the shut-off cone is melting or the computer reads "peak temperature" from the thermocouple. There are variables at play in every firing beyond the ones you expect, like your choice of clay or glaze. The variables not only CAN affect the outcome of your firing, they WILL affect it! It may be tempting to think of your kiln as a giant simple toaster, but it's actually a high-performance machine. Within it, the performance of critical parts like the thermocouple and elements will change as they wear down over time. Witness cones will inform you of what's happening and what's changing, so you can keep up with those pesky variations from what you expected.

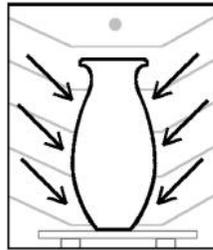
Convection

Convection is the first step in the heating process. Air is heated as it passes across the warming kiln elements. As the hot air rises and the cool air falls, air currents are created which circulate hot air to cooler places in the kiln. This heat is transferred to everything in the kiln: ware, posts, cones and shelves alike.



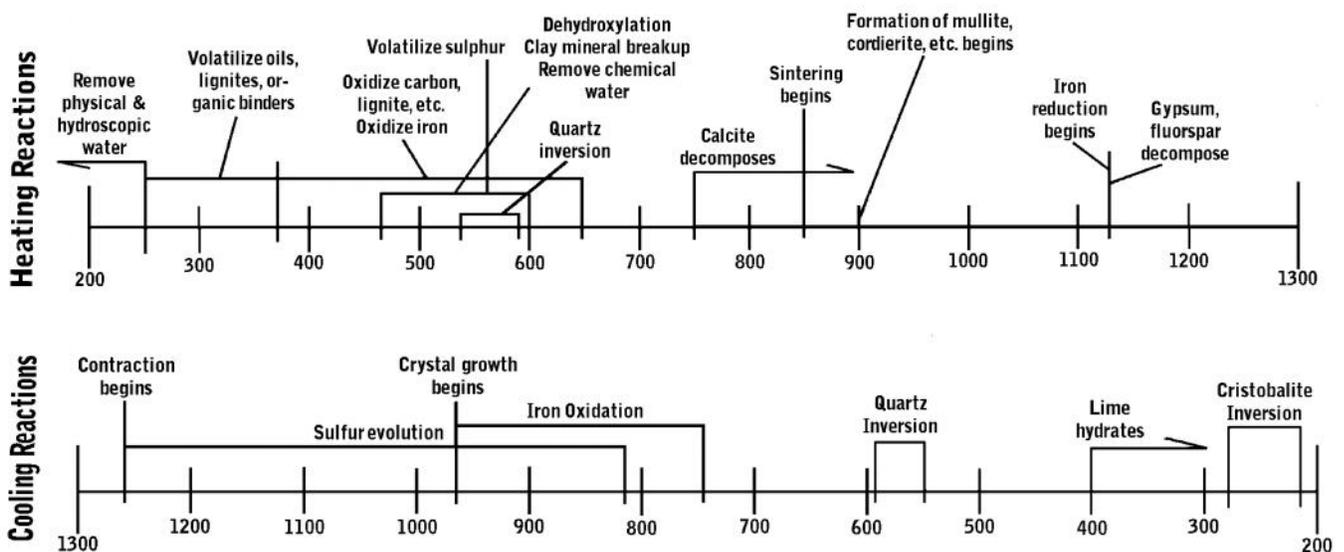
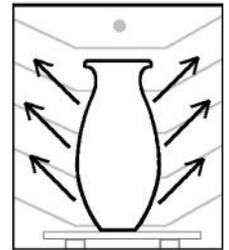
Conduction

Conduction occurs when heat moves through a solid material, moving from the inside to the outside of the kiln and from the outside to the inside of the ware (and shelves and posts and...). Conduction is the main way to spread uniform heat through the kiln. It is a slow process.



Radiation

At the beginning of the firing, the elements are the hottest part of the kiln. Heat radiates out from them, like the sun warming the ground on a cool day. Eventually, the firebrick and the ware itself will get hot enough to radiate heat as well. As the temperature increases, more and more heat is transferred by radiation from the elements instead of convection or conduction.



We found these charts on ceramic heating and cooling in *Ceramic Industry* magazine. Read through them and see ALL that happens on the scale from 200 to 1300°C. Clay is very busy throughout the range, so slow and steady wins the firing race every time!