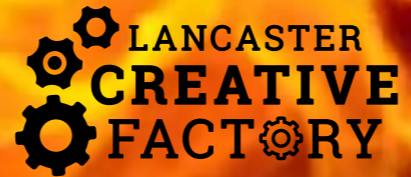


Demystifying Wood Firing:

Investigating multiple variables as a guide
through the complexities of wood firing



Kevin Lehman
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Thank you
working with clay 36 years
wood firing for 24 years
close to 250 wood firings of experience in 15 different kilns to date.
When I started, I want to learn about all the firing techniques in the field. I read about wood firing and heard the process is exciting I also heard that
"You never know what you are going to get out of the kiln".



I began wood firing in 2002 with Amedeo Salamoni, pictured in this image with myself.
His kiln was a 160 cubic foot anagama kiln that we fired several times a year.
After that kiln was dismantled, we started firing a smaller, 48 cubic foot, tube kiln.

Kirkwood Kiln



With this kiln, I began firing on my own, experimenting, honing my skills and understanding the loading and firing processes that produce unique results. I fired with local potters and groups 10 to 15 times per year for the next 13 years.

During this time, I began to realize that the process and the results were not totally random and the quote "You never know what you're going to get" was not as accurate as I once believed. I also heard several statements that I would contemplate for years to come.



Where are the good spots in a kiln?

People would say, "Put my pieces in a good spot."
I wondered, "What is a good spot?" and "What look do they really want?"

Where are the good spots in a kiln?
What look do you want?





Someone else would say, "Last firing my piece was placed in this certain place and looked good. So can I get another piece in that location?" I thought, "The stack is different so the piece will most likely turn out different". It is not just the location that matters when firing.

Is the front of the kiln the best place for flashing?



Someone else would say "I want great flashing so put my pieces in the front of the kiln." I would think, "Is that the best location for that look?"

Is it possible to have a whole kiln of work that has flashing?



Another person suggested, "Let's do a firing that gets a lot of flashing on all the pieces in the kiln."
I would consider, "How could we best do that?"
The questions kept coming and I kept developing some answers but mostly more questions.



image of crusty pieces, pots dripping with ash and pieces with flashing

Where are the good spots in a wood firing? Do you want crusty pieces, pots dripping with ash or the beautiful subtleties of flashing?

I continued to answer and ask questions as I continued learning and experimenting.





Piece By Nate Nixdorf



Over the years, I've heard all kinds of insights and some of them are contradict each other:

How the kiln fires better with a looser stack
Kiln packed tight fires right

How shorter, hotter firings give the best result
How long firings produce great results

How heavy reduction at the end give the best results, you need to seal every crack.

How to fire to get the best flashing

How certain clays provide great results in wood firings

How I need to stack the firing box for some other
wonderful look that I'm not getting
the list goes on and on.







I'm not saying these things are not true, I just think there is more nuance to it than just a single factor.

In my studio, I would look at pieces that came out different kilns, different firings, with different durations of firing, and different finishing temperatures and different ways of sealing or not sealing the kiln for the final atmosphere at the end of the firing.

Some pieces I could tell certain aspects of the firing they were in and other pieces had no distinct aspects and could have been in any of the firings.

I wanted to know why that was.

I always seemed to be comparing apples to oranges so to speak because there were different shapes, glazes and I had little ideas of which pieces went with which firing and what was done during the loading and firing.

So recently, I've taken a more scientific or controlled approach to answering wood-fired questions and began to demystify the process.

I standardized the form, explain the form in the image

worked with certain clays and took notes on what was being done during the loading and firing so I could learn and share the knowledge with others.



All of this brought me to do this experiment and give this talk.
I have 3 reasons for sharing this information is to:
Help to explain the multi-faceted process of firing with wood.

I also want to continue the wonderful conversation about the many different "looks" that are achieved from firing with wood and how to achieve them.

And the final reason for the experiment and talk is to help those that are new to the process, understand how to achieve the look they are looking for in their work and hopefully give veteran wood firers something to contemplate as well.

Through my experience, I thought the results would be very similar to what they were. There were not too many surprises, with the exception of the first firing I did for the experiment which I'll get to later in the talk.

Here is what I did:

8 Variables:



things I didn't consider:

kinds of wood

8 Variables:

1. Types of clay

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2. Kiln design

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7. Final firing temperature/cone

8 Variables:

1. Types of clay
2. Kiln design
3. Placement of ware in the kiln
4. Tight vs. loose stacking of ware
5. Stirring vs not stirring ash
6. Duration of firing
7. Final firing temperature/cone
8. Reduction/oxidation at the end of the firing



Using five distinct clays for the most variation, I used:
a high refractory, sandy, sculpture clay: Standard 420,
a "wood fired" clay: Laguna B-Mix for Wood,
a high iron brown clay: Brooklyn Red,
a lower fire porcelain: Standard 365 and
a gray stoneware: Standard 153
And the final firing temperature ranged from cone 10 to cone 13



Standard 420



Laguna B-Mix Wood

Standard 420





Laguna B-Mix Wood

Brooklyn Red

Standard 420





Laguna B-Mix Wood

Brooklyn Red

Standard 420



Standard 365
Porcelain



Laguna B-Mix Wood

Brooklyn Red

Standard 420



Standard 365
Porcelain

Standard 153



Laguna B-Mix Wood

Brooklyn Red

Standard 420



Cone 13

Standard 365
Porcelain

Standard 153



I grouped pieces in various locations within multiple firings across 4 different kilns, each firing employing unique firing methods. This experimentation unveiled how each variable influenced the outcome. I fired 4 different kilns, 10 firings total with 160 total test pieces.

46 hour
Anagama firing
Back of the
front stack
Cone 11

Backside of tests



Front side of tests

22 hour train kiln firing
Front bottom
Cone 12



Gas burner for 6 hours and wood for 12 hours
12 cubic foot tube kiln
Back top, Cone 10





Gas burner for 6 hours and wood for 13 hours
12 cubic foot tube kiln
Front bottom, Cone 13



Here are my results:
Explain this image:

When I look at the overall image with 160 different test, the main factor that determines the look of the piece is the clay body that is used. The material we choose to work with, is the single greatest factor that determines the look of the pieces.

Different clay bodies



Pieces by Amedeo Salamoni

Another example of clay body



The second factor that contributes to the final look of the pieces is PLACEMENT IN THE KILN: moving from front to back, the work closer to the fire box or side stokes have more ash than the pieces farther away

46 hour
Anagama firing
Front bottom
Cone 12



All the pieces placed in the fire box or near the side stokes can have crusty ash on them.

46 hour
Anagama firing
Front bottom
Cone 12



22 hour
Train kiln firing
Front bottom
Cone 12



Gas burner for 6 hours
and wood for 13 hours
12 cubic foot tube kiln
Front bottom, Cone 13



46 hour
Anagama firing
Front bottom
Cone 12



22 hour
Train kiln firing
Front bottom
Cone 12





Front of kiln, low in the firebox



Same clay different location in the kiln



The amount of ash in the atmosphere
of the kiln depends on:

The third factor that contributes to the final look of the pieces is the amount of ash the piece receives during the firing. This includes several other variables that contribute to the amount of ash. examples of each:

The amount of ash in the atmosphere
of the kiln depends on:

Kiln style

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Stirring vs not stirring ash

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Tight vs loose stacking

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Duration of firing



Kiln style:

Tube kiln
12 hours
wood



Train Kiln
16 hours



Noboragama
32 hours
Soda added



Anagama
40.5 hours



Front to back of kiln
Stirring, 56 hour firing



Front to back of kiln
Not stirring, 40.5 hour firing



How we teach people to stir and how they actually stir can be 2 different things.
Time vs what you do with that time

Tight stack



Vs



Loose stack

Address the test forms, could have been a different shape: round forms?



Kiln style
Stirring vs not stirring
tight vs loose stack
duration



heavy reduction vs light reduction at the end. No carbon probs just flame and smoke as indicators



153 heavy to light reduction





high iron clay has a greater tendency bloat and dunt



Greenware vs bisque ware



Front of tests

Back of tests

green vs bisque
i only did one experiment...



high temp then dropped in temperature and heavy reduction at the end

Important Factors

In conclusion,
Wood firing is a complex art, influenced by numerous variables that collectively shape the outcome.
If you're interested in developing your work for wood firing, here are the important factors.

The clay type plays the most significant role in how the body interacts with heat, ash, and glaze.

Positioning within the kiln affects the degree of heat and ash exposure.

Different kiln designs, such as train kilns (bourry box kilns), anagama (tube-like kilns) and noborigama offer unique atmospheres, ash distribution, and flame patterns.

Stirring the ash in the firebox can introduce variability, while not stirring can lead to drier clay surfaces and more uniform results. Glazed work for not stirring?

The arrangement of pieces in the kiln also matters: tightly stacked pieces can create faster-moving flames around the ware, producing unique flashing, while more spaced-out arrangements allow for greater ash distribution to the back pieces, resulting in diverse effects. Also, shielding smaller pieces behind larger pieces can affect the look

Firing length can impact clay maturation and glaze development, with longer firings possibly yielding richer surfaces as more ash moves throughout the kiln.

The end firing temperature, measured in cones, determines the final state of the clay and glaze, influencing both surface texture and color.

A reduction atmosphere at the end of the firing can enhance depth, richness, and darken the clay bodies, while oxidation leads to lighter clays and different glaze and ash colors.

The type of wood used can affect the results; hardwoods produce intense heat and ash, while softwoods burn quickly and don't generate as much ash, which may yield different colors.

Wood firing provides a finishing process that contains a certain amount of variation that I cherish. Pieces can be placed in the kiln and "set-up" for a certain look with the results having a range specific effects.

For instance, pieces that are placed in the back of the kiln have less fly ash and a very different look from those placed in the firebox that receive a heavy dose of ash and a crusty finish.
The type of look will be known but the actual amount of ash, flashing patterns and the colors are unknown until the unloading.

By delving into these elements, potters and artists can unravel the complexities of the process, leading to distinctive artistic expressions that blend scientific principles with creative intuition.

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1. Clay body is the most important factor in the look of the finished work

- High refractory clay
 - much less warping
 - drier surface with less ash build up
- Flashing
 - With higher alumina and lower silica ratio
- Stoneware
 - Good all around with a wide variety of looks
- High iron clay
 - Red to brown
 - Can bloat and dunt
- Porcelain
 - Whiter in color
 - Good flashing
 - Can warp

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- Stoneware
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- High iron clay
 - Red to brown
 - Can bloat and dunt
- Porcelain,
 - Whiter in color
 - Good flashing
 - Can warp quite a bit



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2. Placement in the kiln, close to the fire or farther away from the fire

- In the ash
- Front of stack near side stoke, more ash, drippy
- Back of stack less ash, flashing

3. Amount of ash

- Kiln Style: Train, tube, noboragama
- Stirring vs not stirring
 - train kiln constantly dropping ash into the atmosphere
- Tight vs loose stacking
- Duration

4. Oxidation vs reduction at the end of the firing

1. Placement in the kiln, close to the fire or farther away from the fire
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Considerations for a successful firing

Keep an open mind: story of my first firing and the firebox plate with Amedeo
lots of bowls near the end of the loading...ended up in the front
1900 with wet wood

Considerations for a successful firing

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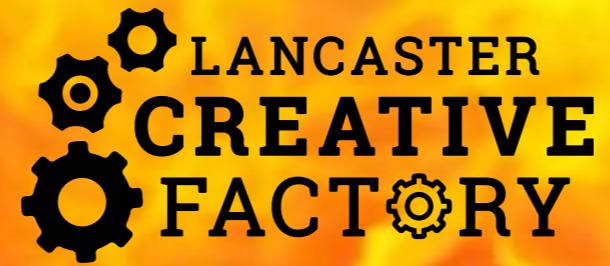
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Considerations for a successful firing

- Keep an open mind
- Know what you are looking for but be able to accept something very different.
- Experiment
- Tall and thin always in and bowls and plates tend to wait
 - Bowls and plates might not be the best in the front of kiln
- Have good wood, seasoned and dry wood

Wood Firing Demystified



Kevin Lehman
www.klpottery.com

Thank you
Samples up front
contact me through my website:
klpottery.com