

a guide to ceramic kilns



choosing the right kiln firing method and design for your art



SKUTT
KILNS & POTTER'S WHEELS

This special report is brought to you with the support of Skutt Ceramic Products

A Guide to Ceramic Kilns

Choosing the Right Kiln Firing Method and Design For Your Art

Without kilns there would be no ceramics. Since the very beginning when primitive man discovered the soil around a fire changed to rock, learning how to contain the heat and control it has been an ongoing endeavor. Many types of kilns have been constructed over the millennia and today we're fortunate to have such a wide selection to choose from. You can choose the type of kiln atmosphere you want (oxidation or reduction), the type of fuel you want to use (oil, gas, electric, or wood) and maybe even the special surfaces you want (salt, soda, raku, or pit). This Ceramic Arts Daily guide to types of ceramic kilns will help you make all these decisions. Written by Richard Zakin, this guide is excerpted from his popular book **Ceramics: Mastering the Craft**, Second Edition, 2001. For more information on this book and Richard Zakin's other book, **Electric Kiln Ceramics**, go to www.ceramicartsdaily.org/bookstore.



Kiln Atmosphere

Ceramic firing can be done with two types of kiln atmosphere, oxidation or reduction. The one you choose for your own work determines the type of kiln you need.



Fuel-Burning Kilns

Certain kinds of visual effects can only be produced with fuel-burning kilns. Find out why you might consider a wood kiln or using oil and gas as fuels, or maybe you to learn more about salt and soda firing.



Electric Kilns

Potters use electric kilns more than any other type of kiln. They're easy to operate and you can choose between many commercially made models, including small test kilns and front loading varieties.



Kilns and Kiln Designs

by Richard Zakin

A kiln is a chamber made from refractory (nonmelting) materials. The ceramist places ware in the chamber. Heat created in this chamber (or in a firebox close by) is contained there and so builds up to high temperatures. The ceramic ware undergoes the firing and cooling process. While clay can be fired in an open fire and does not require a kiln, kilns must be used to attain high temperatures. Furthermore, they allow the ceramist excellent control of heat rise and fall and protect the ware during the rigors of the fire. Therefore, almost all contemporary potters use them.

The kiln designer's job is to make a kiln that keeps its structural integrity over a period of many firings while being efficient and keeping heat loss to a minimum. The kiln must allow the ceramist to efficiently control temperature rise and fall inside the kiln. It must be carefully designed for safe and efficient use of the fuel and must protect the ware during the firing. It must allow the ceramist access for loading and unloading and must have a "spy hole" to provide a view of what is going on inside the kiln during the firing.

Kiln Atmosphere

This term refers to the oxidizing or reducing properties of the fire. These properties strongly influence the character of the ware.

Reduction Firing

In the reduction process the ceramist reduces the amount of oxygen allowed to enter the firing chamber. A fuel-burning kiln demands a great deal of oxygen: it is very natural for the atmosphere inside a fuel-burning kiln to become depleted of oxygen during the firing. Reduction leaves its mark on both clay bodies and glazes. It modifies color and visual texture. Clay body color is deepened, sometimes moving to rich oranges and reds and sometimes to gray colors. A strong visual texture is created by dark spots



David MacDonald. Here we see the rich surface of a sawdust-fired smoke reduction piece.

that occur in a random but pleasing manner over the surface of the piece. These are caused by particles of iron oxide which have been changed to black iron oxide in the reduction process. Glaze texture and color are also modified. The dark spots that mark the surface of the clay come



John Neely, "Teapot," reduction cooled. Neely maintained reduction conditions in his kiln during the cooling period. In this way he was able to produce the black body color we see in this piece. A glaze would be redundant here.

through to the glaze and mark it as well. Glaze color can be strongly marked by reduction: for example, copper will turn a blood red, white glazes take on a cream color with a broken texture of dark spots, iron greens and other colors become burnt oranges and brick reds; sky blues become slate blues.

Flashing

Flashing occurs because fuel-burning kilns allow the ceramist to subject the work to direct flame. In the flashed area, color will be deepened and the transition from one color to the other may be marked by unpredictable visual effects. Flashing occurs naturally in fuel-burning kilns. The ceramist may heighten the effect by modifying the flame path inside the kiln or by strongly reducing one or two burners in a multiple-burner kiln.

Reduced and flashed work is valued for its rich and unpredictable character.

Low-Fire Reduction

We often associate reduction with the high fire but it is

also used in the low fire and can result in very effective surfaces. Low-fire reduction lets us darken and enrich clay surfaces while leaving the surface of the clay completely revealed so that it may speak for itself.

The black pottery of African village potters and the similar work of the Pueblo potters of the Southwestern United States are examples of low-fire reduction. So too are the carbon blackened surfaces we see from some raku firings and sawdust firings.

To carry out a sawdust firing the ceramist packs the work in sawdust in a simple kiln structure, sets the sawdust on fire, and allows it to burn until combustion ceases from lack of fuel. As the sawdust burns, rich patterns of carbon smudging are left on the surface of the piece. Pieces fired in sawdust have a natural and direct quality that can be very appealing. Sawdust firing has the advantage of being economical - sawdust is usually free for the taking. The firing is carried out in a simple firing container rather than in a true kiln. These only require a top and a wall with small openings to allow air to enter and smoke to leave during combustion.

A Sawdust Firing



Applying a stain to the surface of the piece.



Placing the piece on a bed of sawdust. More sawdust will be added to cover the work.



Placing wadded up newspapers on the sawdust to start the fire.



Setting the newspaper on fire.



Covering the fire with sheets of metal after the sawdust has been ignited.



Removing the cooled work a few hours after the four to six hour firing is finished. The darkened work can now be cleaned and waxed.

The best thing about the sawdust fire, however, is that the work that comes from it is marked by the fire and this can be very appealing. Furthermore, sawdust firing is very appealing to students new to ceramics, it is spontaneous and can be quickly learned.

Pieces intended for the sawdust fire can be painted first with stains or terra sigillata. The sawdust fire is very effective with these surface coatings and the fire markings are emphasized.

Making a Sawdust Kiln

The sides of the structure should have openings to allow ready access of air to all parts of the densely packed sawdust. If the kiln is made from bricks (common red brick will do) they should be laid without mortar and with openings to allow air to enter. If using a metal garbage can (which works well) pierce the sides with a sharp tool to allow the entry of air.

Firing a Piece in the Sawdust Fire

You Will Need

- ▶ Piece suitable for sawdust firing (strong and compact in shape and you may wish to bisque fire it first)
- ▶ Sawdust kiln
- ▶ Sawdust to fill the kiln
- ▶ Metal lid for the kiln

The Procedure

- ▶ Place a layer of sawdust in the base of the kiln.
- ▶ Place the pieces to be fired in the kiln and surround them with sawdust. If you wish the fire to proceed fairly slowly (the safest option), pack the sawdust fairly tightly around the pieces.
- ▶ Cover the pieces with a layer of sawdust.
- ▶ Place the metal lid over the kiln, temporarily leaving a gap of a few inches to create a bit of a draft.
- ▶ Start the fire with pieces of paper and let this burn for a few minutes.
- ▶ Close the lid of the kiln.
- ▶ During the first hour check the fire periodically and restart it if necessary. After 30 minutes the fire should be well enough established to stay lit until all the sawdust has burned.
- ▶ Unload the pieces the next day and brush off any burned sawdust.
- ▶ Lightly wet the pieces and wax and buff them. If a piece is too delicate to wax and buff, spray it with a transparent acrylic medium or a liquid wax.

The Pottery of African Village Potters

African village potters create a low-fire reduction ware whose surface is a rich, lustrous, dark black. The work is fired in the open in impromptu firing structures composed of the pots plus shards and fuel. Firing takes place over a very short period - perhaps an hour or two. The method differs from

sawdust firing in that at the end of the firing, the potters pull the still hot work from the fire and pour oil over it. The oil quickly burns and stains the surface of the piece carbon black. This is polished and the piece is done. The surface color is more uniform than that from a sawdust fire. Although this method is very simple, the resulting surface is very elegant and effective.

Oxidation Firing

In this kind of firing oxygen is allowed free access to the kiln chamber. In the past this was not so easy, wood-fired kilns naturally went into reduction during the firing. Even then not all ceramists fired in reduction. For example, lead glazes boil and bubble in reduction. Ceramists who finished their pieces with lead glazes took the trouble to control their kiln firings and avoid reduction. With the advent of modern kilns it became very easy to fire in oxidation. Fuel-burning kilns, whose burners are fan driven, lend themselves to oxidation firing. The very popular electric kilns not only lend themselves to the oxidation fire; most of them are not designed to be fired in reduction at all.

The contemporary ceramist must decide whether to use an oxidation or reduction firing atmosphere. This will dictate the choice of a kiln. Neither oxidation nor reduction is superior; both are tools to be used by the ceramist when appropriate.

Fuel-Burning Kilns

Fuels are organic and carbon based, they burn readily. Until recently, all kilns were fuel burning; even now when we have ready access to easily fired electric kilns, many ceramists continue to use fuel-burning kilns: this kind of firing has an enduring appeal. Very simply, there are certain kinds of visual effects that can only be obtained from a fuel-burning kiln.

Fuels can be divided into solid, liquid, or gaseous. Until the late 19th century only solid fuels were available. Animal dung, wood, and coal are all solid fuels. In kilns fired with solid fuels the unburned ash residue must constantly be removed. Only one solid fuel - wood - finds a great deal of use among contemporary ceramists in the developed countries. Now most fuel-burning kilns are fueled with a liquid such as oil, or a gaseous fuel such as natural gas or propane.

Fuel-burning kilns may be very simple structures; sawdust kilns fall in this category. More sophisticated fuel-burning kilns are designed around a concept of heat flow and they can be categorized in this way. As a result, we call the various designs updraft, crossdraft, and downdraft.

In updraft kilns the firebox is at the base of the kiln: the flame moves up through the ware to an exhaust and a chimney at the top of the kiln. In kilns of the crossdraft design the flue is on the side of the kiln - the side opposite the burners - so the heat travels through the ware and is then drawn up the chimney. In downdraft kilns the flame begins at a firebox in front or on the sides of the firing chamber. It



Mary Roehm, "Punctuated Bowl," 6" x 11", 1999, porcelain, natural ash glaze, wood fired to cone 12. Roehm's approach to the wood fire is exuberant and inventive. While based on tradition it is highly experimental and innovative.

is directed up over the ware and then back down again through the ware. The flame is exhausted into an under-floor chamber and from there is drawn up the chimney. The crossdraft and downdraft designs are the most complex and efficient: it is much easier to reach the high temperatures required for stoneware and porcelain temperatures using kilns of the crossdraft and downdraft type.

Most fuel-burning kilns are built by the ceramist rather than a commercial firm. To build them requires knowledge, time, and skill. Many kilns are the result of innovative and creative thinking and have a real impact on the life and work of the ceramist.

The Wood Kiln

Wood is a surprisingly versatile fuel; in many places in the world it is the most economical and widely available fuel.

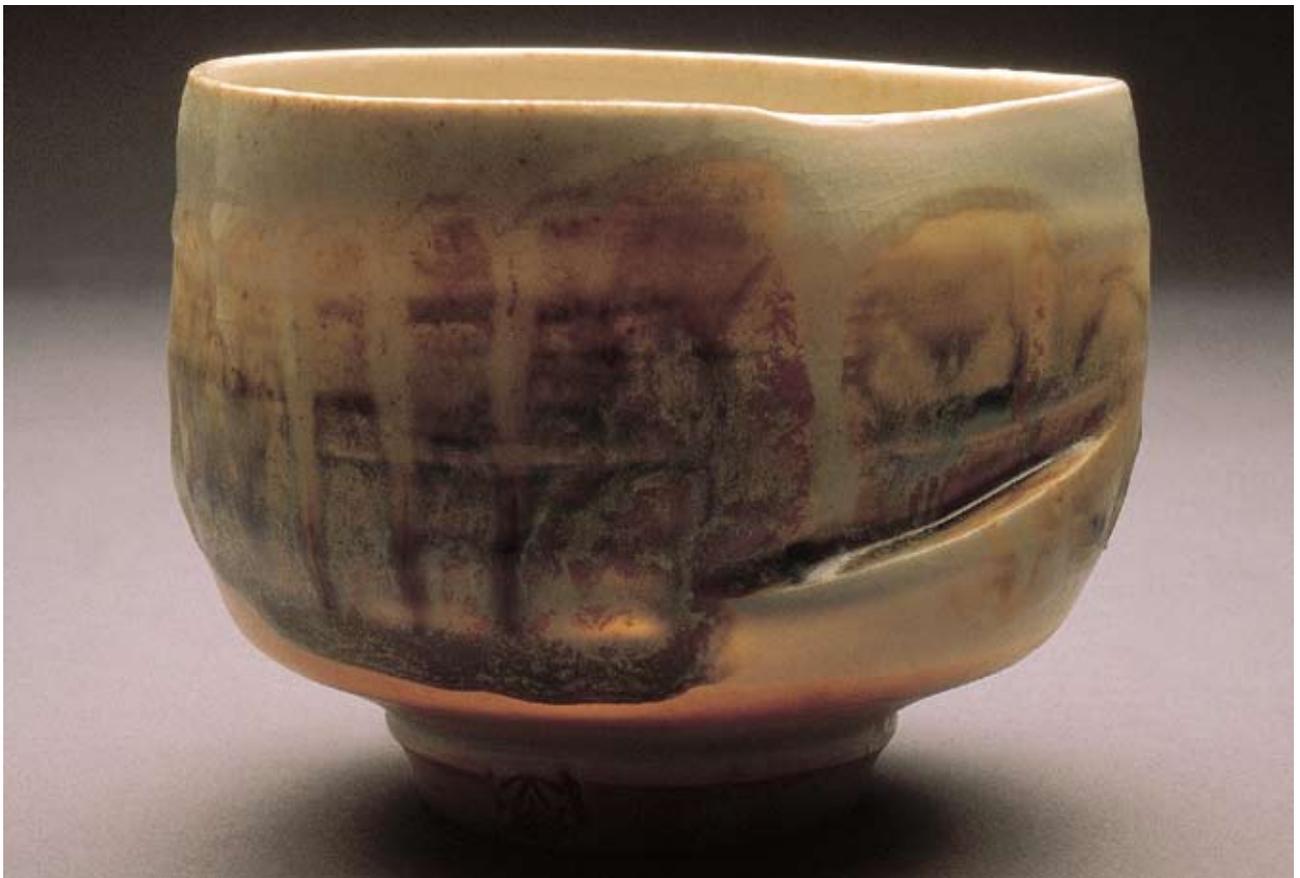
There it still may be used for low-fire work in simple updraft kilns. In the developed countries, however, wood is mostly used for high-fire work in complex downdraft kilns.

Firing a wood kiln to high temperatures is physically demanding and requires constant attention: it calls for an instinctual understanding of what is going on inside the kiln. Almost all high-fire wood kilns work on the crossdraft or downdraft principal. These require a firebox in the front or bottom of the kiln with supports (made from either clay or metal) to hold the burning wood. There must be an outlet for spent gases; this outlet is usually placed near the bottom rear of the kiln. Finally, the outlet is connected to a chimney rising above the kiln which pulls the spent gases from the kiln and exhausts them into the atmosphere.

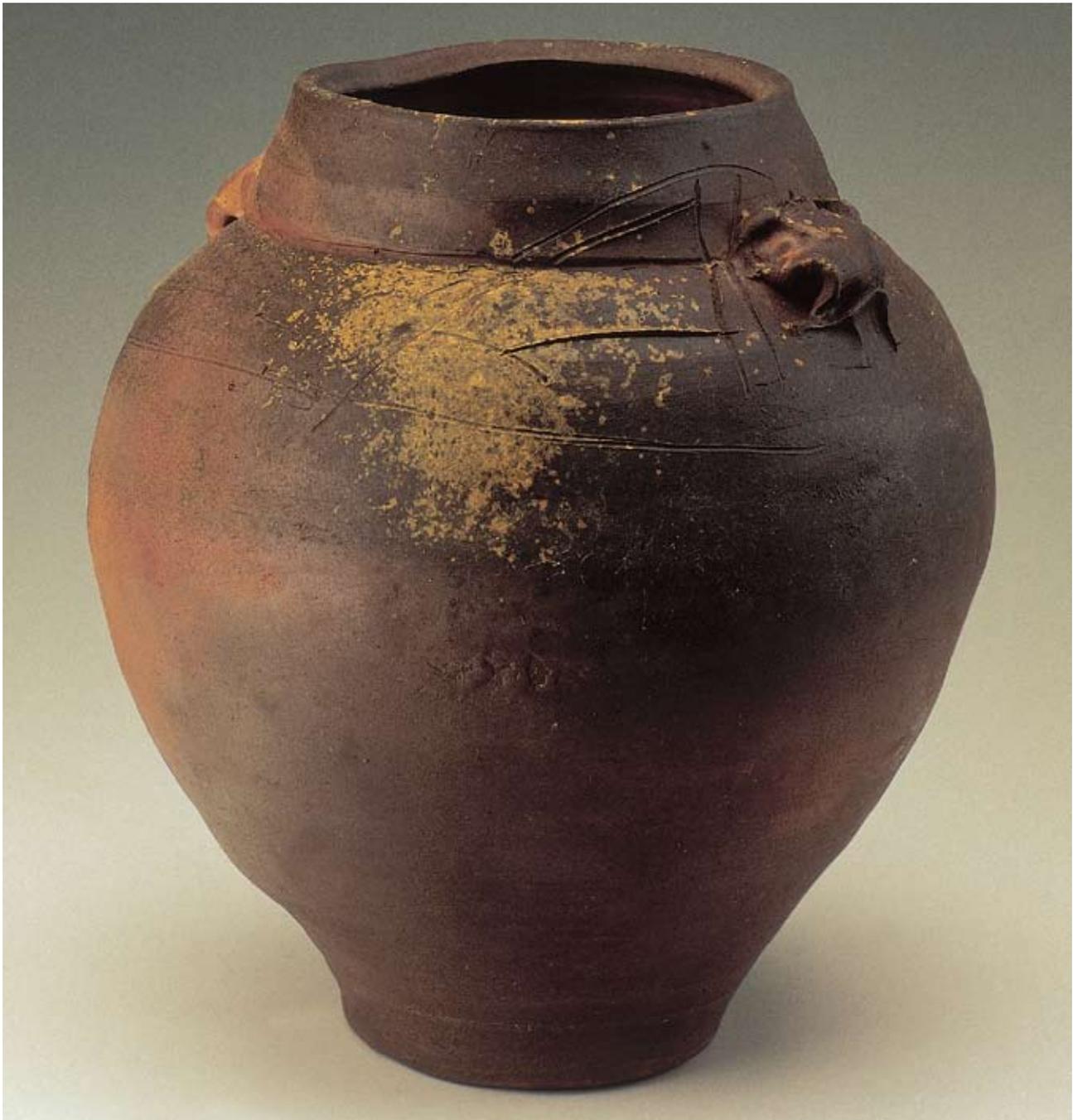
High-temperature wood firing is still used today by ceramists who value the richness of its wood ash, flashing, and reduction effects. During the firing the ashes of the wood



Paul Soldner, "Sculpture." Soldner fired this piece in the wood kiln. Other than the glaze that settles on all pieces in the wood kiln, this piece is unglazed and testifies to the effectiveness of this way of working.



Pat Oyama, "Thrown Porcelain Bowl," wood fired at cone 14. In its luminous color, rich textures, and translucency we see the result of this very high-temperature wood fire. Photo by Bob Hsiang.



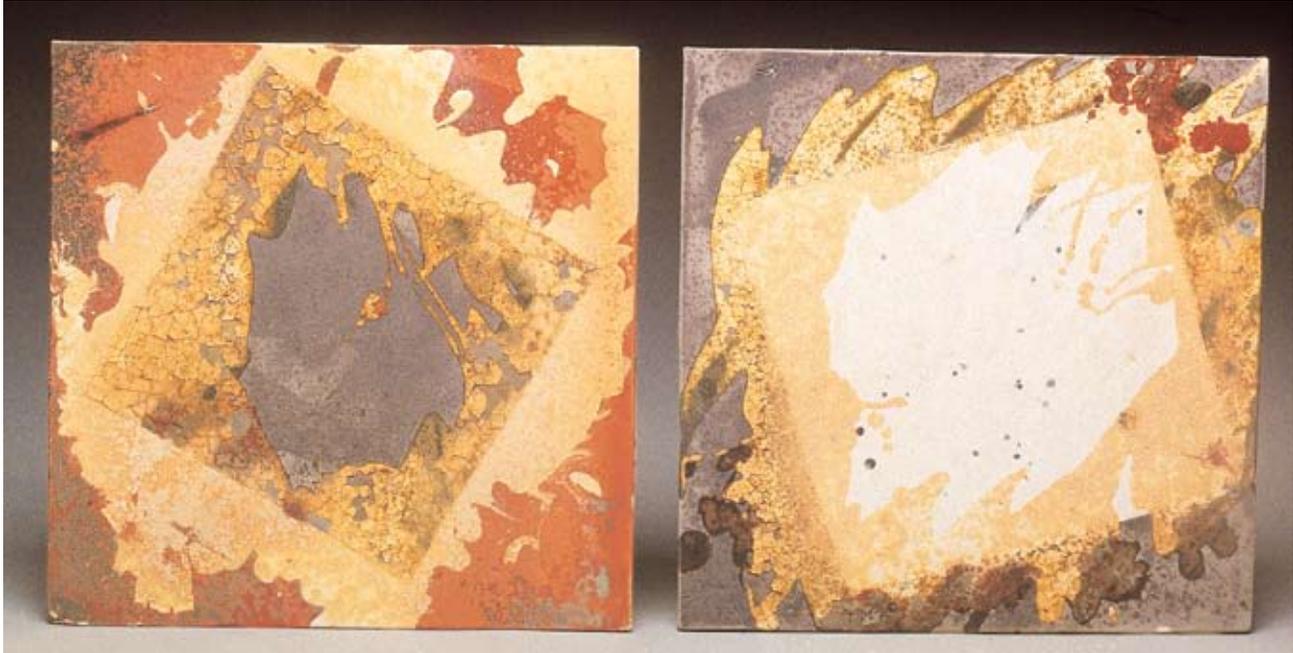
Janet Mansfield, "Anagama Fired Jar," height 45 cm. *This piece was made from local clay and glazed with the ash naturally generated during the firing. The fuel was eucalyptus wood. The firing took three to four days in Mansfield's anagama kiln.*

fuel fall naturally upon the ware, and if the firing temperature is high enough the ashes are volatilized and become a glaze. These glazes have a soft dappled imagery which covers the top surfaces of the piece and falls gently away toward the foot of the piece. The richness of these surfaces is the main argument for using wood as a high-fire fuel. The high temperatures necessary to create these effects were first attained by the Han potters in China (200 B.C. to 200 A.D.).

A special variant of the wood kiln is the hill-climbing kiln (known to the Chinese as the Dragon kiln and the Japanese as the Anagama kiln). In this very old design the ceramist



Charles Hindes, "Wood-Fired Tea Bowl," 1998. *A classical interpretation of what the wood fire can do. Hindes has focused on this aspect of ceramics with great emotional and intellectual intensity.*



Kathryn Holt, "Shifting Planes," 18" x 18", tile form, earthenware, once fired with a light salt application in an oxidation atmosphere. For a number of years Holt has engaged in a group of very absorbing experiments with unusual materials and firing strategies. These explorations are neither purely scientific or purely aesthetic but rather combine both approaches to create a group of very special objects.

relies on the height of the top part of the kiln to act as a natural chimney. This is a multiple chamber design; each chamber is connected to the next. The flame passes from one chamber to the next, moving up the hill until it exits at the last chamber at the top of the kiln. In this way a draft is created and the kiln can reach high-fire temperatures.

Oil and Gas as Fuels

Liquid and gaseous fuels have become highly favored among contemporary ceramists. This is because they do not require constant stoking and they create no unburned ash residue that must be periodically removed. These fuels include oil, kerosene, natural gas, and propane. Modern kilns fired with these fuels are very flexible instruments and allow the ceramist to use a wide variety of glaze types and rich visual textures.

Oil is widely available, inexpensive, and has many advantages. Those who fire with oil maintain that pieces fired in the oil kiln are apt to be a bit richer and a bit more highly reduced than those fired in the gas kiln. On the other hand, it is difficult to keep an oil flame lit until the temperature inside the kiln is above 1000°F. Oil-fired kilns must have a burner system which compensates for this characteristic. Oil kilns are also apt to be a bit smokier than gas kilns.

Kilns fueled with natural gas or propane (a derivative of natural gas or petroleum) do not have combustion problems and so are used more in highly populated areas than oil kilns. The burners used to fire these fuels are quite efficient and have only a moderate impact on the environment.

Natural gas, delivered in pipes, is popular in the United States and Canada. Its price is moderate but its availability is limited to populated areas. Propane, while more widely available, is more expensive. Because these fuels have very little residue and no ash they do not encourage as much visual texture as do wood or even oil kilns.

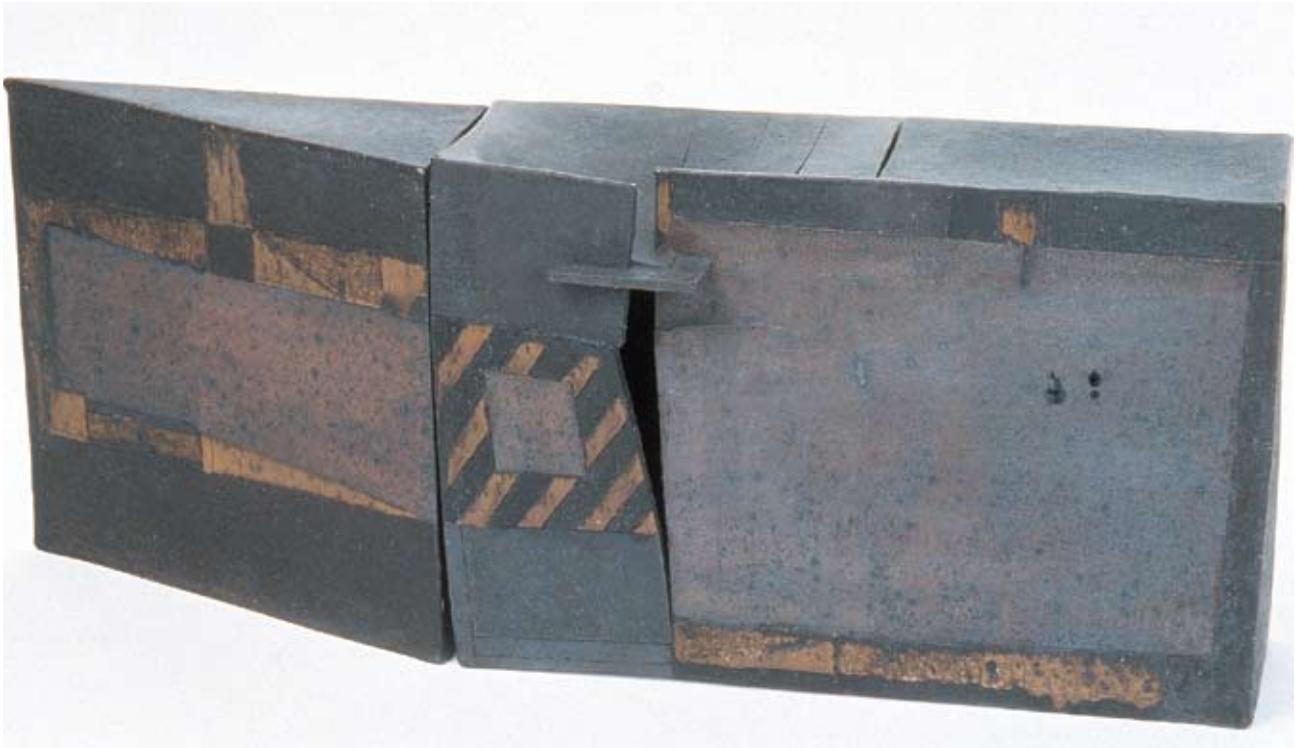
Oil and Gas Kiln Design

Many high-fire oil and gas kilns are downdraft designs. These kilns have a firebox at the front or the sides of the firing chamber (most often at the sides). These kilns are very similar in design to those meant for firing solid fuel with the exception that since there is no unburned ash residue, the firebox can be smaller and need not have a door for the removal of ash.

There are gas kilns that are updraft in design and employ very powerful blower-driven burners. These rely on the efficiency of the fuel and the power of the burners to reach high temperatures. This design type is commonly found in commercially manufactured gas kilns.

The Salt Kiln

Salt firings require fuel-burning kilns that are specifically designed for the salt-firing process. They are constructed from refractory materials high in alumina (relatively unaffected by the salt that covers everything in the kiln). Special ports are built into the side of the kiln. At the point when the kiln is nearing the highest part of the fire (generally near cone 9 or 10), the ports in the kiln wall are



Robert Winokur, "The Italian Hill Town," 40" x 9" x 16" (in two parts), 1996, salt glazed, Pennsylvania brick clay with slips and engobes. Winokur shows that salt fire can be very persuasively used to create architectural, highly thought out, imagery. Collection: Los Angeles County Museum. Photo by John Carlano.

opened and salt is forced into the kiln. The salt reacts very strongly to the heat of the fire and breaks into its component parts, sodium and chlorine. The chlorine is expelled as a gas (see sidebar on chlorine). The sodium is deposited on the surface of the ware with such force that the silica and alumina of the clay unite with the sodium from the salt to create a glaze on the surface of the piece. This surface is marked by a strong visual texture, called "orange peel," a very active pattern resulting from the violent chemical reaction produced as the salt is exposed to the heat of the kiln. It is this surface which distinguishes salt firing from all other glaze treatments.

Colored slips may be applied to the body before firing; the salt will cover these without obscuring them but will enrich these surfaces to create a unique effect. Salt firings are particularly effective when used with pieces made with porcelain or porcelainous clay bodies. These bodies bond well with the salt and their white color is complemented by the salt glaze. Salt firings typically are taken to cone 9/10.

Toxic Side Effects of the Salt Fire

Salt is composed of sodium and chlorine. In the fire the two break apart and the chlorine becomes a gas. This gas is toxic (chlorine was used as a poison gas in World War I). Salt kilns should be located outdoors or in a well-ventilated kiln room.



A close-up view of a salt-fired surface. This photo clearly illustrates the light/dark patterns associated with the salt fire.

Soda Firing

Soda firing (sodium carbonate) is similar to salt firing (sodium chloride), but it differs in that it is nontoxic (the chlorine in sodium chloride becomes a potentially toxic gas when the salt burns in the kiln). Soda firing also makes less residue inside the firing chamber. Most important, soda has its own unique and subtle character. The soda glaze surface is thin, nicely textured, durable, clear, and tightly bonded to the clays and slips it rests upon. As is the case with salt, it



Maren Kloppmann, "Box," 4½" x 4½" x 4½", 1998, porcelain thrown and altered, finished with terra sigillata and glaze, then soda fired. These pieces are fine illustrations of what soda firing can do to enrich ceramic surfaces. Photo by Peter Lee.



Peter Pinnell, "Jar," height 9", 2000, grey porcelain, wheel thrown and altered, coated with terra sigillata and fired to cone 8 in a reduction soda fire. This piece is a fine illustration of the character of soda-fired work. The color is rich and the surface is highly modulated and marked by some visual texture but not the strong overall light and dark pattern known as orange peel that we see in the salt firing.

takes a good deal of heat to bring out the best of the soda. Therefore, most soda firings are to cone 9 or 10.

At the height of the firing the ceramist introduces soda (sodium carbonate) into the kiln. The soda unites with the alumina and silica in the clay to form the clear surface finish. Many glazes react especially well to soda firing. The application of soda encourages these otherwise stable surfaces to become active and highly flowing and the colors to brighten. In some sections of the work the glazes pool and run off the edges of the form. They lighten these edges, highlighting those areas where the form changes direction.

Soda firing is very effective when used with slips and glazes that have a mat surface. Where the soda affects them most they turn shiny, while elsewhere their surface stays dry or mat. Soda enriches the surface of unglazed areas of the piece and they take on a slight sheen. The contrast of these unglazed areas with those that are glazed is very appealing. Many ceramists who work with soda prefer spraying it rather than scattering it inside the kiln because in this way the soda diffuses over the ware most effectively (this is



Lisa Ehrich, "Amputees," 66" x 48" x 12", 1999, thrown and hand-formed pieces assembled, stoneware clay body sprayed with white slip, iron oxide (in local areas), then soda fired. Photo by Tracy Hicks.

important because soda does not explode and scatter in the heat of the fire in the same way as salt).

Soda firings are different from salt in that the salt firing results in an overall light and dark pattern (often called orange peel). Soda does not really do this. Instead, it causes the glazed surfaces to react to the soda by intensifying color and by encouraging highly flowing and pooling glazes. Though this was a 17th century technique, many contemporary ceramists have been active in reviving it. They were looking for a kind of firing that produced gases that seemed to be somewhat less dangerous than the chlorine gas that is a byproduct of salt firings. They wanted a look similar to salt fire, however. They ended up with a look that was in some ways similar and in others quite different from that of the salt fire.

Electric Kilns

Electric kilns are used by contemporary ceramists more often than kilns of any other type. They are produced in large numbers and are sold at relatively low prices. Their economy, simplicity, reliability, and relatively benign impact on the environment guarantee their great popularity. They are somewhat limited in the eyes of many ceramists because they do not lend themselves to the rich effects of reduction

and flashing that characterize fuel-burning kilns. On the other hand, they have many virtues - they lend themselves to a wide color range, are simple to load and fire, and are reliable and efficient.

Electric kilns are very simple structures. They are essentially closed boxes made from soft, porous, highly insulating bricks. Inside the kiln, running along channels grooved into its walls, are coils made from a special alloy. Heat is produced by forcing a great deal of electric current through these tightly wound coils. The result is friction and the result of the friction is heat. This heat is even, easily controlled, and quite reliable.

Electric kilns may be fired manually or with the aid of control mechanisms. Older models are limited to terminating the firing when the kiln reaches maturity. Newer, computer-controlled designs can be used to control the firing from the beginning till its end, raising and lowering the temperature as required.

Though electric kilns are useful at all parts of the firing spectrum, they are particularly suitable for low- and mid-fire work. They are not quite as well suited for work at the highest part of the firing spectrum: coils that are used for high firings tend to wear out more quickly than those used only for low-temperature firings. However, if careful glazing



A front-loading electric kiln. Courtesy of the Fredrickson Kiln Co.

and cleaning procedures are used this need not be an insurmountable problem. At present the manufacturers of coils for electric kilns recommend that they not be fired above cone 8 (1263°C/2305°F) but if care is exercised they will last fairly well even if fired to cone 9 (1280°C/2336°F).

Purchasing a Commercially Made Electric Kiln

Most electric kilns are purchased completely assembled and ready to plug in. Their design and construction vary a great deal: it is no easy matter for the ceramist to make an intelligent purchasing decision.

At one time most electric kilns were front loading. Kilns of this design are highly durable for they must be heavily braced. This makes them very heavy and bulky. While front-loading kilns are expensive, this design results in a kiln that

Sara Radstone, "Sculpture," hand formed, fired to cone 7 in an electric kiln. Fired in sections and joined after firing. Radstone works with pinched out slabs, which are marked with the texture of this pinching process. She forms large slabs, then cuts them into sections when they are leather-hard (she is using a small electric kiln at present and this dictates the maximum size of each section). She then applies various ceramic surface finishes to the slabs. She combines oxide washes, very thin mat glazes, and/or vitreous slips. After the firing she reassembles the sections and joins using a metallic glue. The look of the work is strongly influenced by the process of its creation.



lasts a long time and can be loaded quickly and easily. Top-loading electric kilns have been very popular for years because they are relatively inexpensive. These kilns must be carefully designed for they are subject to mechanical and heat stress, particularly in their roof and hinge areas. If you choose a top-loading kiln, make sure the roof is replaceable. The flat roof of a top-loading kiln will eventually crack under the stress of normal use. The roof hinges, also points of stress, should be designed with strong elongated arms to keep them away from the heat path. Many newer top-loading electric kilns are segmented. The electrical connections between each segment can be a source of real problems. Look for connections made with industrial grade cables which can withstand the stress that results when the heavy segments are assembled and disassembled.

The gutters that hold and support the coils should be deep and set at an angle to hold the coils securely. The coils should be pinned to the soft brick with refractory metal pins to insure that they will not come loose and sag during the stress of the high fire. The coils should be made from an alloy that resists high temperatures (such as Kanthal A1); they should be easily replaceable and fairly thick (thin coils burn out very readily), and should be consistently wound to avoid hot spots. The switches, wiring harness, and connecting wires should be heat resistant and of the highest quality. Connections to the power source should be secure: a poorly connected coil will soon burn out. The insulation should be effective and durable.

Look for kilns that fire evenly. Floor-mounted coils help keep an even heat throughout the kiln. They add to the expense of the kiln but are a mark of a professional design. Computer-controlled zone firing has proved very effective in assuring an even firing. Each zone is furnished with its own pyrometer and the computer is programmed to direct current to those coils that need it most. Originally computer control was envisaged as a way to automate the firing. An



even firing was an unanticipated benefit.

Electric kilns are high current devices and they require special, high quality, high capacity fuses, cables, and outlets. For the installation of an electric kiln there is no substitute for the services of a qualified electrician.

Small Test Kilns

Most small test kilns are very simple devices and they can be easily built or purchased. They are electric fired and work from normal house current (110 volts U.S., 100 G.B.). They have small firing chambers, usually under a square foot in area, are portable, quick firing, and inexpensive. Because of the quick pace of the firing, pieces fired in these kilns are likely to crack or explode. Furthermore, their quick cooling adversely influences the look of the glaze. In a normal firing cycle, glazes have a chance to develop a crystalline pattern during the cooling period. Most glazes derive a great deal of their character from the process of crystallization, a process which opacifies and modulates their surfaces. A glaze fired in a test kiln that has been allowed to cool quickly will not only lack character, it will also not look the same as a glaze fired in a standard kiln. To control the firing cycle and encourage rich glaze surfaces, the current flowing to the test kiln must be controlled so that the coil runs only part of the time. This can be done with a reliable and inexpensive device called a "current interruption" switch. If you purchase a test kiln, you



Two colored clay body test pieces.

may be able to find one with the controller already installed.

The following firing cycle is recommended for test kiln firings: 10 minutes on very low current with the kiln lid open, then close the lid. After 20 minutes, turn up the switch. Continue to turn it up every 20 minutes, switching the current from low to medium to high. Leave the kiln at the high setting until the cone bends and the kiln has reached the desired temperature. Now the kiln must be fired down. Turn the switch down every 30 minutes, switching the current from medium to low to very low. At the end of this

procedure turn the switch off and allow the kiln to cool. An hour later, partially open the lid. Forty minutes later take off the lid and empty the kiln.

You can fire finished pieces as well as tests in these tiny, quick-firing kilns. While you must tailor the form and size of the piece to the limitations of the kiln, in many cases this presents an interesting challenge. Small-scale ceramic objects such as jewelry are perfect for this kind of kiln. Since the kiln is so portable and may be installed anywhere, it is conceivable that a ceramist who is on the move might find it a useful tool.

DIAGNOSTICS

PRE-HEAT

LID LIFTER

BUILT-IN PROGRAMS

TECH SUPPORT



SKUTT
KILNS & POTTER'S WHEELS



NCECA

Schedule - Booth #514

Thursday - **Steven Hill**
The Ergonomics of Throwing

Friday - **Robin Hopper**
Throwing Demo

**When you buy a KilnMaster,
it's like getting a Labtech with every kiln.**