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# The Cost of Firing A Kiln

by Viqui Sanchez (with thanks to John S. Hohenshelt, president of Paragon Industries, a well known manufacturer of kilns)

"Firing a kiln is very expensive!" Any company that provides kilns regularly encounters this misconception among customers. The truth, however, is very different. Even in periods when the cost of electricity spikes upward, the cost of firing a kiln is more affordable than most artists think. Why is this important? For two reasons: First, to when you know the cost, you can decide if it's cost-effective for you to have the convenience of your own kiln in your studio. Second, knowing exactly what you spent to fire any given piece (or collection of pieces) helps you to set a price for your work that reasonably covers this cost.

In this paper, we'll examine the cost of firing a kiln and discuss the basic information needed to calculate the firing costs of any particular kiln. Two examples illustrate the application of the calculation formula to kilns typically operated by artists and jewelry makers.

The cost of firing a kiln will depend on several factors, such as the charge assessed by the electricity provider, the power drawn by the kiln, the duration and makeup of the firing program being performed, and the number, size and composition of the pieces being fired. Is the kiln being used constantly throughout the day, every day, or is it being used periodically or even occasionally? These factors will be different for each artist, making the cost of firing different for each one.

## The Formula

To calculate the firing cost, use the following formula:

Cost per kilowatt-hour[1]
x Kilowatt rating of kiln[2]
x Program duration (hrs.)[3]
x Duty cycle of the kiln[4]
Cost of firing program

1) Providers of electricity charge for power in kilowatt (kW) hours. The cost per kW-hour ranges from approximately $0.10 to $0.20 depending on location. This rate is shown on the provider's monthly bill.
2) The kilowatt rating of the kiln can be found on the electrical data plate located on the side of the control box on the kiln. The data plate shows the volt, phase, amp and watt capacities of the kiln. Most smaller, introductory kilns that operate on 120-volt standard household outlets draw about 1500 to 1800. Medium-sized kilns (17"–23"W) are rated around 5000 to 8000 watts. Some large glass kilns can be rated as high as 11,000 watts. To convert the watts shown on the data plate to kilowatts, simply divide the watts by 1000: 1500 watts = 1.5kW; 8000 watts = 8.0kW.
3) The program duration is the number of hours the kiln fires to complete its program. This elapsed time is displayed on the digital controller at the end of the firing cycle. The firing time can be less than an hour or up to 20 hours, depending on the project. If the kiln does not have a digital controller, just measure the time from starting the kiln to when you turn off the kiln.
4) The duty cycle for the kiln is the amount of time the elements are actively drawing electricity. Electricity is going through the elements ONLY when the relays are ON. The clicking or humming sound heard when the kiln is

operating is a clear indictor that the relays are ON and the kiln is actively drawing power. Generally, the duty cycle for firing of a kiln with controlled ramp rates, hold times and so on, is roughly 50%–60%. During a program that takes about six hours, the relays will only be actively on, drawing power, for about 3–4 hours.

# Examples

Here are two examples, applying the above formula to two firing programs in two different kilns.

### Example #1

In an area where the cost per kW-hour is $0.12, a small-sized kiln operates on standard 120-volt household power and is rated at 1700 watts (1.7kW). The firing program is a fast fusing of glass with a total firing time of 1-1/2 hours. A duty cycle of 60% (0.60) is assumed.

Putting this information together, the formula looks like this:

$0.12 cost/kW-hr.
x 1.7 kW rating
x 1.5 hrs. duration
x 0.6 hr. duty cycle
$0.18 cost of firing

Here is a table showing the firing cost for the same kiln and program at different costs per kilowatt hour:

| Cost/kW-hr. | Cost of Firing |
|---|---|
| $0.10 | $0.15 |
| $0.12 | $0.18 |
| $0.14 | $0.21 |
| $0.16 | $0.24 |
| $0.18 | $0.28 |
| $0.20 | $0.31 |

### Example #2

In an area where the cost per kW-hour is $0.12, a medium-sized kiln operates on 240-volt power and is rated at 7000 watts (7.0kW). The firing program is a basic firing for BRONZclay with a total firing time of 9.5 hours, including ramp and hold times. Again, a duty cycle of 60% (0.60) is assumed.

Putting this information together, the formula looks like this:

$0.12 cost/kW-hr.
x 7.0 kW rating
x 9.5 hrs. duration
x 0.6 hr. duty cycle
$4.79 cost of firing

Here is a table showing the firing cost for the same kiln and program at different costs per kilowatt hour:

| Cost/kW-hr. | Cost of Firing |
|---|---|
| $0.10 | $3.99 |
| $0.12 | $4.79 |
| $0.14 | $5.59 |
| $0.16 | $6.38 |
| $0.18 | $7.18 |
| $0.20 | $7.98 |

Customers generally find that these costs are less than expected. There is no change to the cost per firing if the kiln uses three-phase, as opposed to single-phase, power because the kilowatt usage remains the same. Firing with large numbers of pieces versus a single piece has only a marginal impact on the firing cost.

Once you've done these calculations for a variety of the programs and materials you use in your kiln, you get a good feel for the cost of any given program. Some controllers provided by kiln manufacturers now feature the capability to calculate the cost of each firing cycle. The customer need only enter the kilowatt-hour cost of their electricity and, at the push of a button, the controller displays the cost at the end of the firing.

Firing your enameled, metal clay or glass pieces in your own shop is surprisingly affordable and the benefit (and convenience) of knowing exactly what this part of the production process is costing you—not to mention having this capability at your service whenever you want it—is just about priceless.