Firing an Alpine Updraft Kiln

Vince Pitelka, 2011

The Overnight Preheat

For glaze firing in most gas kilns it is not necessary to do an overnight preheat with the burners on low, but it in the Alpine updrafts it is always a challenge to achieve even temperatures top to bottom, especially at low-fire temperatures, and this slow overnight preheat helps a lot. ***A word of caution*** – the small blowers and rheostat control on these burners are imprecise at best. The setting on the rheostat can shift slightly, and the motor can speed up very slightly after it is set, especially if started in cold temperatures. For an overnight preheat we normally set the rheostats on low with a minimum burner flame, but the rheostat should always be turned to high for a minute or two to get it going, and then adjusted down to the lowest setting. If you are getting accustom to an unfamiliar kiln, be sure to do this setting when you can stay around for a few hours to check on it, because if the blower speed increases slightly, it could cause burner blow-off or flame-off, extinguishing the flame. The pilot will attempt to relight the burner, but the same thing will happen again and again. You need to have the gas turned high enough that this will not happen, but not so high that the kiln climbs excessively overnight.

Ensure Uniform Burner Settings

The following firing schedules assume that the rheostats work properly and affect each of the blowers equally, and that the rheostat dials are marked 1-10. You will be able to tell whether a particular WCI (water column inches) gas pressure setting and a particular rheostat setting on one burner produces the same flame and sound as the same settings on the other burner. If not, readjust one to match the flame appearance and sound of the other. If you find broad discrepancy in rheostat/blower performance, then it would be a good idea to install primary-air intake shutters on the blowers, keep rheostats on high, and do all air adjustments with the primary-air shutters. This does not hurt the blowers at all, because they are actually working less when they are sucking a slight vacuum. They work harder when they are moving more air.

Importance of the Side Ports

Never plug or block off the firebox side ports. It is imperative to recognize their importance as firing gauges. Starting at bright red heat (around 1400F) you must maintain a small blue flame at the side-ports. This flame ensures adequate back-pressure to promote more-even temperatures top to bottom, and it is not an indication of reduction atmosphere. In reduction firing, a blue-orange or short, intense orange flame at the side-port and damper slot will indicate a partial-reduction atmosphere at low temperatures. A short, intense yellow flame at the side-port and damper slot will indicate a partial-reduction atmosphere at midrange and high temperatures. A larger, less intense orange flame at low temperatures and yellow flame at high temperatures will indicate a full reduction atmosphere, but such an atmosphere is necessary only for good body-reduction on claybodies where it matters, or during body reduction to promote certain glazes like carbon-trap shinos and copper reds. Otherwise, a partial-reduction atmosphere from the end of body-reduction to target-cone temperature is adequate to give the best results with reduction glazes, and a heavier reduction

atmosphere will just darken the glazes and promote more outgassing, possibly causing craters and blisters.

Importance of Turbulence

Updraft kilns with front-, rear-, or side-mounted power-burners depend absolutely on a combination of turbulence and back-pressure to ensure even temperature and atmosphere. That means that you want a flame that is shorter and more intense than you might have on a downdraft kiln with similar burner configuration. The gas and blower-rheostat settings below are intended to ensure the necessary turbulence, while the damper settings control the back-pressure. Keep in mind that every Alpine kiln is different, especially those that have been around for years and have been modified here and there. You will have to adapt as necessary, but this handout should provide a good general guideline and starting point.

Modifications to the Alpine

The most common and necessary modification to older Alpines is to eliminate those ridiculous refractory burner tips that stick right into the firebox. This will require removing the burners, removing and discarding the refractory burner tips, cutting back the burner pipe about 6" with a pipe cutter, welding on a threaded pipe nipple, and installing an Eclipse or Stick-tite flame-retention burner nozzle. This will produce a much more reliable and stable flame, and the tips will last indefinitely. Assuming that you cut both burner tubes back 6", purchase one 12" pipe nipple of the appropriate diameter and threaded on both ends, cut it in half, and weld half of it on each of the two burner tubes. The burners should be re-mounted so that the tips are perfectly centered in front of the round burner ports, and the face of the burner tip should be ½" from the face of the kiln.

Unaltered versions of the Alpine generally have removable refractory grates at the top of the fireboxes. Their presence or absence will have no impact on how the kiln fires, but they do seem to help prevent warpage of the vertical kiln-shelf bagwalls after repeated high-firing. You can get by with less of them, as long as they do still help to support the bagwall.

Some updraft kilns using this configuration of burners do not have bagwalls at all, since the flame is directed parallel to the wares rather than towards them. Since the Alpine uses only a thin kiln shelf as a bagwall (compared to a brick bagwall), removing them altogether might place the flame a little too close to the wares, and might also have an impact on the way the side-ports indicate atmosphere and back-pressure. If you do remove your grates and bagwalls on an Alpine, I would very much appreciate knowing how the kiln fires.

Cone-Packs for the Alpine

The general rule for any cone-gauged firing is to have a minimum of three cones in each cone-pack, including the warning cone (one cone below the target cone), the target or firing cone, and the guard cone (one cone above the target cone). If you are doing a body reduction in a midrange or high-firing, use a cone-012 to begin body reduction if you want to promote copper reds or carbon-trap shinos, and use a cone-08 if your only concern is to bring out color and speckles in the claybody.

If your alpine is equipped with a pyrometer, you will initiate correct backpressure (short blue flame at the side-ports) when the kiln reaches 1400F. If you do not have a pyrometer, then include a cone-016 in your cone-pack to tell you when to initiate back-pressure. Keep in mind that a cone-016, cone 012, or cone-8 will melt completely at midrange or high-fire temperatures, and you must provide an appropriate pinched basin or tray to catch the melting cones.

Every Alpine is Different

Please note that the time intervals specified below are estimates based on firing experience with particular Alpines, including a 20 cubic-foot, a 30 cubic-foot, and a 40 cubic-foot. As soon as you get above bright red heat, you should go by temperature and cones with little regard for the time intervals specified, with the caveat that you do not ever want to proceed too quickly in the latter part of the firing. That is the section of the firing when time is most important, in order to allow the clay and glazes to mature properly. Quick firing at the end of a glaze firing gives bland, featureless glazes that look like a coat of spray-paint.

Alpine Updraft Firing Schedule – Cone-04 Oxidation Glaze-Firing

- 10:00 p.m. - Light pilots. Open damper to ½". Turn blower rheostats to high for a minute to get them going, and then readjust to the lowest setting. After setting the rheostats on lowest setting turn main burner gas valves on until burners just barely light.
- 8:00 a.m. - Turn blower rheostats to 30. Turn on main burner gas to 1 WCI pressure reading on gauge (WCI – water column inches of pressure). Open damper to 1", and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 8:30 a.m. - Kiln approx. 500 degrees F. Turn air to 70 and gas to 2 WCI. Open damper to 1 ½" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 10:00 a.m. - Turn air on full and gas to 3 WCI. Put in spy-hole plugs. Open damper to 2" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 11:00 a.m. or as soon as kiln reaches 1400F or cone-016, close damper a little at a time until small blue flame shows at damper slot and firebox side-ports.
- 2:00 p.m. approx. – Cone-04 down. Shut off main switch or valve, turn off burner valves and rheostats, and close damper all the way.
- After two hours, open damper to 2".

Bubbles in the glaze always occur during firing as a result of volatilization of materials in the clay and glazes, but they normally smooth out at the maturing temperature. If you have trouble with bubbles in the glaze in low-fired wares it is most likely a result of the kiln reaching temperature too quickly in the latter stage of the firing and/or cooling too abruptly. A short soaking at maturing temperature should eliminate this by allowing the volatilization to complete, and closing the damper completely will prevent the kiln from cooling too quickly. To soak the kiln simply turn the air back to 30, the gas to 1 WCI, close the damper to ½", and then open the damper a little at a time until all flame just

barely disappears from the side-ports. Allow kiln to soak for a half hour or so, and then shut off as instructed above.

Alpine Updraft Firing Schedule – Cone-04 Reduction Glaze-Firing

Most low-fire glaze-firings are conducted without any period of reduction for the same reasons as in bisque-firing. Also, some commercial low-fire glazes are damaged by a reduction atmosphere. If you do want reduced effects in the clay, slips, glazes, or patinas, the following schedule will accomplish that.

- 10:00 p.m. - Light pilots. Open damper to 1/2". Turn blower rheostats to high for a minute to get them going, and then readjust to the lowest setting. After setting the rheostats on lowest setting turn main burner gas valves on until burners just barely light.
- 8:00 a.m. - Turn blower rheostats to 30. Turn on main burner gas to 1 WCI pressure reading on gauge (WCI – water column inches of pressure). Open damper to 1", and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 8:30 a.m. - Kiln approx. 500 degrees F. Turn air to 70 and gas to 2 WCI. Open damper to 1 ½" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 10:00 a.m. - Turn air on full and gas to 3 WCI. Put in spy-hole plugs. Open damper to 2" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 11:00 a.m. or as soon as kiln reaches 1400F or cone-016, close damper a little at a time until small blue flame shows at damper slot and firebox side-ports.
- 1:00 p.m. approx. - Kiln approx. 1730 degrees. Cone 08 down. To initiate body reduction, turn air down to 50 (low-medium) and close damper until orange flame shows at damper and firebox side-ports. Flames should not back up out of burner ports.
- After 30 minutes body-reduction open damper to 2", turn air on full, wait a minute, and then close damper until small blue-orange flame shows at side-ports and damper slot in order to initiate partial-reduction.
- 2:00 p.m. approx. – Cone-04 down. Initiate oxidation cleanup – turn gas down until all flames disappear from damper, side-ports, and spyholes.
- After 30 minutes of oxidation cleanup, shut down kiln. Shut off the main switch or valve, shut off burner valves and air rheostat, and close damper all the way. After two hours, open the damper several inches to cool the kiln faster. ***Do not leave the damper open right away***.

Alpine Updraft Firing Schedule – Cone-6 Reduction Glaze-Firing

- 10:00 p.m. - Light pilots. Open damper to 1/2". Turn blower rheostats to high for a minute to get them going, and then readjust to the lowest setting. After setting the rheostats on lowest setting turn main burner gas valves on until burners just barely light.
- 8:00 a.m. - Turn blower rheostats to 30. Turn on main burner gas to 1 WCI pressure reading on gauge (WCI – water column inches of pressure). Open damper to 1", and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.

- 8:30 a.m. - Kiln approx. 500 degrees F. Turn air to 70 and gas to 2 WCI. Open damper to 1 ½" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 10:00 a.m. - Turn air on full and gas to 3 WCI. Put in spy-hole plugs. Open damper to 2" and then close a little at a time until you feel slight back-pressure at the top spyhole when you wave your hand quickly across the opening.
- 11:00 a.m. or as soon as kiln reaches 1400F or cone-016, close damper a little at a time until small blue flame shows at damper slot and firebox side-ports.
- 1:00 p.m. approx. - Kiln approx. 1730 degrees. Cone 08 down. To initiate body reduction, turn air down to 50 (low-medium) and close damper until orange flame shows at damper and firebox side-ports. Flames should not back up out of burner ports.
- After 30 minutes body-reduction open damper to 2", turn air on full, wait a minute, and then close damper until small blue-orange flame shows at side-ports and damper slot in order to initiate partial-reduction.
- As temperature increases, flame at side-port will turn yellow-orange and then yellow. If there are copper glazes in the kiln it will likely take on a slight greenish tinge.
- Approximately 5:00 p.m. – Kiln approx. 2200 degrees – cone-6 down.
- Oxidation cleanup – turn gas down until all flames disappear from damper, side-ports, and spyholes. After 30 minutes of oxidation cleanup, shut down kiln. Shut off the main switch or valve, shut off burner valves and air rheostat, and close damper all the way. After two hours, open the damper several inches to cool the kiln faster. ***Do not leave the damper open right away***.

Alpine Updraft – Cone-10 Reduction Glaze-Firing

The schedule for a cone-10 firing is the same as for a cone-6 firing except that you must allow more time. Either come in earlier in the morning after the overnight preheat, or else expect to stay around into the evening. The kiln will take another 3-4 hours to reach cone-10, but if you are not seeing reasonable temperature climb, you may need to turn the gas up to 4 WCI, with corresponding adjustments to the damper in order to maintain the proper partial-reduction atmosphere.