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space between the two rows of shelves with tumble-stacked pots and to side stoke this area for some eight hours before going back to the front of the kiln and taking the whole kiln up to cone 12. This part of the kiln began to produce really exciting pots.

In 1996 I went to Australia and for six weeks I worked with Ian Jones. During the packing and firing of his kiln I noticed how much attention he gave to these side stoking areas and how much time he spent stoking for ember accumulation.

When I returned to England, I decided to build another kiln on a different site. This is a 150 cu. ft. tube kiln, 16 feet long with a 6' x 42” catenary arch. It has a sand floor and the brick firebox floor is at the same level to encourage embers to pour back over the setting. The kiln is stacked with 4 rows of shelves separated by 12” of side-stoking space. These areas are tumble-stacked. I usually have three largish jars at the back of the firebox, and the shelves are tightly stacked right up to the arch. I use as few shelves as possible and stack pots on top of each other. Alternatively, I have large pots where the front two rows of shelves are.

I fire to cone 9 in about thirty hours and then start to side stoke, usually with finely split ash filling up the first side stoke area before moving on to the second and third and then back to the first. I do this for about 70 hours, each section burning down as I stoke the next. Finally I go back to the front, which has reached about cone 11, and stoke it to cone 12 flat before commencing light side stoking to take the rest of the kiln to cone 12. The total firing time is 110 hours.

More than any other kiln I have built, this last kiln was built for a specific type of firing—to maximize contact between flame, ash, embers and the pots. I have finally learned to make things easier for myself. The side stoke covers hang from chains, the floor is sand (easy on the knees), there is ample room to move around the kiln, no pit to climb in and out of, and all the wood is cut, split and stacked ready for use. The whole process has changed from a titanic struggle to simply nudging the flame along. Having hated firing all my life, I am finally beginning to enjoy it.

Of course the kiln is a tool, but for me it is much more. I enjoy building them, I like to simplify and I love the shape of a good kiln every bit as much as that of a well-formed pot. The firing process does seem like gambling—I use all these hard-earned resources in the hope of getting lovely pots, and like the gambler I am mostly disappointed. But I get it right just enough to make me want to go back for more.

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WATER AND WOODFIRING

by Richard Bresnahan

It may seem counter-intuitive to put water into a high-temperature wood-fired kiln. But it is actually a technique with an eight-hundred-year history, which produces unique and beautiful colors and textures.

The main reason to introduce water into the kiln at the end of firing is to oxidize the environment, clear carbon,
and rapidly cool the pottery. The practice dates back at least to the 12th and 13th centuries, where some of the earliest evidence is found at Tokoname, Japan. When the Tokoname Prefecture museum staff and Koie Ryoji-san excavated an Anagama kiln grouping, they found large water storage jars at the base of the groupings. It is very likely that these water jars held water to be used in the kilns.

The Idemitsu Museum sponsored Qyuemon Mizuno, an Echizen-ware scholar, to research Anagama kilns and fire some pieces in an Anagama constructed on the footing site of a Kamakura-period kiln. According to Qyuemon-san, who published the results of his research and experiment, the first three firings were unsuccessful in replicating Echizen color and surface. But by pouring eight to ten liters of water into the ash pit of the Anagama before sealing it off, they produced results very similar to Kamakura and later-period Echizen-ware. The findings provide strong evidence of water usage in Anagasmas, although it’s not clear whether the water was used to deliberately clear the reduced atmosphere or to accelerate the cooling process.

ACCIDENT LEADS TO DISCOVERY

The most recently documented firing using water inside kilns was in 1969 on Tanegashima, a small island south of Kagoshima, Japan. The Cultural Ministry of Japan undertook the restoration of a pottery on Tanegashima at the request of the Tanegashima government. Koyama Fugio, director of Tokyo National Museum, Idemitsu Museum and renowned ceramic art historian and potter, assisted by Nakazato Takashi, son of a National Living Treasure, built a Teppo-gama (gun kiln) based on designs from 12th-century Korean tunnel kilns.

The first firing of the new Teppo-gama wood kiln was much more exciting than expected. Koyama-san had arranged for an NHK (Japan National Broadcasting) crew to fly out from the mainland to film the first firing and unloading. The film crew was due to arrive on the third day of the firing, but since a typhoon was brewing, all flights to the island had been canceled. The film was very important to Koyama-san and Nakazato-san. It hadn’t been easy to convince the cultural ministry to start the project, and Koyama-san was anxious to prove its worth. The film would help do this.

By the third day of this first firing, the clay had already matured, and large amounts of charcoal had built up. Since the film crew couldn’t make it as scheduled, Koyama-san opened the stoking window and hosed down the pots to cool them. Although he assumed that most of the work was already ruined from over-firing, he reasoned that at least the water would enable them to continue firing until the TV crew could get through. A three-day firing had turned into a six-day firing by the time the crew arrived. They got there in time to record dramatic flames.

The film crew was scheduled to return later for the unloading. Koyama-san and Nakazato-san decided to quickly unload, load and fire again in hopes of having a better result before the TV film crew returned. But they found that there was no reason to stage a second unloading: The results from the first firing were strikingly successful.

The unusual firing process had achieved a wide range of color palettes and soft skin-like surfaces not seen in Six Old Kiln (medieval Japan) Anagama history. Koyama-san proclaimed a new discovery of unique Anagama ceramic work. As with so many groundbreaking discoveries, this one came about mainly by accident—Koyama-san put water into the kiln in order to keep the firing going for the filming, only to discover that it had striking effects on the clay itself.

Koyama-san built his own Tanegashima kiln at Hananokigama in central Japan. It was one meter by one meter and measured ten meters long with a seven-degree rise. It used an underground water system with valves. This system was put into the foundation below a bed of flint rock similar to the flint rock beds of groundhog kilns in the Seagrove area of North Carolina.

I was part of the team that fired Koyama-san’s last works in November 1975, during my apprenticeship at the Nakazato Takashi studio. The Tanegashima-style firing took nine days. Water was introduced at the end of the firing, after all the air intakes and stoking windows had been sealed, producing a thundering volatile sound inside the kiln. There were nine pyrometers installed in the floor, side walls and arch to give readings to pinpoint where temperatures went above 1100°C. The elevation above cone 6 was of great concern. Whenever there was a slight rise above 1100°C, water was introduced from under the foundation of that specific area in order to reduce the temperature.

Small amounts of water were put into the kiln for about an hour after it had been sealed off. The mechanical dampers were then closed to seal the atmosphere inside, and the kiln cooled for seven days. These changes in the kiln environment produced an exciting palette of earth tones: oranges, reds, blues, tans, blue gray and patterned fly ash.

TANEGASHIMA KILNS AT TAKASHI STUDIO

A multi-chamber (noborigama) kiln was constructed at the Nakazato Takashi studio in 1975-1976. It combined the traditional Karatsu glaze kiln of front-fire mouth and three glaze chambers with a Tanegashima chamber and experimental salt chamber at the end. Firings between 1976 and 1979 yielded only marginal results in the Tanegashima chamber. No underground water system had been built into the Tanegashima fifth chamber, and the color quality was muddied, with little definition in color palette. The only quality of color produced from that chamber was a
heavily reduced spot dark brown with a slight variation.

A second kiln was constructed on the Nakazato Takashi pottery site, built to the exact dimensions of the kiln on Tanegashima. To prepare for this, I was sent by Nakazato-san to Tanegashima island to assist with a firing and draw the kiln designs of Tanegashima Pottery. This second Teppo-gama was built by apprentices, using handmade brick. A system of underground concrete water pipes carried water under and into the kiln from a nearby stream. The last pipe junction was left unsealed in order to allow water to seep slowly and continuously up through the kiln floor during the firing. The results from this second Teppo-gama were much better. It produced a softer black palette with occasional orange and red blushes at the surface. It is still the primary kiln used at the Nakazato Ryutagama studios.

San San Oizumi-san and Shige Morioka are two other Japanese artists who have learned the Tanegashima style of firing and have done exemplary work with it. San San-san was Koyama-san's last apprentice, and Shige-san attended and helped with two firings at Nakazato Studio in 1976 and 1977.

Shige-san built Tanegashima-style kilns at his studio, using water in a variety of ways, from underground piping to wetted sawdust to water balloons. (The water balloon proved very dangerous. Readers are cautioned not to experiment with it or any other methods of getting water into the kiln using containers inside the kiln.)

**TANEGASHIMA IN THE USA**

The American sculptor Joy Brown was Shige-san's apprentice and was influenced by this style. She creates lovely Tanegashima-style sculpture at her studio in Still Mountain Center in South Kent, Connecticut.

The Pottery Studio at Saint John's University in Collegeville, Minnesota fires a three-chamber noborigama. The third chamber fires Tanegashima-style. There are three underground water lines in fireboxes placed equidistantly from front to back of the kiln. The kiln is fired for a total of ten days, with the Tanegashima-style chamber fired for four of the ten days. We have varied the amount of water put into the fireboxes over the last 20 years. In the early 1980s, we poured 400 gallons of water into one fire chamber, with the result that the vitrified pieces fired to cone 8 were returned to a highly oxidized bisque ware. In the last three firings, we very slowly poured one liter of water per side into the tube pipe for each side of the kiln.

Over the years, the Saint John's Pottery Studio has found that less water provides the widest color palette. The ideal time to introduce these small amounts of water into the kiln seems to be when the barometric pressure begins climbing and our stoking pattern changes. This is usually between 4-7 AM, as the sun rises and the earth warms.

**A NEW CERAMICS**

The history of the technique of putting water into wood-fired kilns began with an archaeological discovery, which led to an era of risky experimentation. This was followed by a period in which the technique was refined, in Japan and elsewhere. As a result, the story of ceramics has a new chapter. And potters have a tested method of producing, through the firing process itself, a rich earth-tone palette unparalleled by chemical glazes or other firing methods.

Richard Bresnahan, 17007 Norman Road, Avon, Minnesota 55301. Richard operates the Saint John's Pottery Studio and fires a three-chambered noborigama kiln.

**BOURRY BOX FIRING**

by Dee Buck

I first became interested in woodfiring in 1977, a result of being active in the alternative energy, anti-nuclear movement. Treading lightly on the earth has always been important to me, so woodfiring seemed the natural fuel choice. Therefore, my initial decision to use wood as a fuel was based more on ecological concerns than aesthetic ones. I simply wanted to use discarded wood because it was a renewable source of energy and it saved landfill space. I soon discovered the wonderful gift of wood fly-ash and now use it for both reasons.

My choice of kiln design was based mostly on economics. The Bourry firebox design contained the heat, minimizing the exposure of heat on the stoker. The firings seemed less arduous than the Olsen fast-fire type designs that were popular at the time. I fired a kiln with such an open firebox design during the Texas summer and can attest to the heat exposure. The Bourry firebox also allowed for traditional stacking methods, i.e., kiln shelves, which I wanted to employ given the very functional nature of my work. I desired a subtle touch of ash and flame as opposed to heavy ash accumulation.

For the past fifteen years, we have employed the one hundred-cubic-foot wood-fueled kiln as a production tool, firing it sixteen to eighteen times per year. Two years ago we lessened our dependence on woodfiring by firing much of our standard ware in a natural gas, reduction soda kiln. The results are very compatible with my woodfired pots. We now fire our wood kiln six times per year, making a wide range of functional and decorative pots. We use a native Texas stoneware clay and employ glaze as a liner only, allowing the wood ash to react with the exterior of the pot.

The firing procedure is quite manageable with two-to-