

Salt Glazing or How to Cope With a Dragon

*Aage Birck describes his
process of salt firing*



*Image 1: Sculpture with a Plane
(surrounded by found objects).
Slip A. 40 cm high.*

A BRIEF HISTORY OF SALT GLAZING: Salt glazing dates back to the 15th century. The technique of salt glazing is a contribution – maybe the only contribution – from Europe to the evolution of glazes, not to forget the German, Herman Seeger, who invented the Seeger formula for calculating glaze recipes and their melting points. There are many theories of how it all started, from sabotage of a kiln while firing stoneware by throwing salt into the fireboxes to the observation that the unglazed woodfired stoneware carried shiny flashes possibly coming from the sodium content in the wood.

Three factors are necessary in order to produce a salt glaze:

- Kilns able to reach temperatures between 1200 and 1300 centigrade.
- Clay being high in silica and low in iron oxide contents such as grey burning stoneware clay or porcelain.
- Access to inexpensive salt and wood.

All of these factors came together as the river Rhine in Germany passed through areas like Westerwald and cities like Siegburg, Köln and Frechen. Westerwald, as the name indicates, had a richness of wood. It was and still is the major area for excellent clays. The Rhine provided a major trading route in the Middle Ages and inexpensive salt was produced in the Netherlands and Austria (think of Salzburg and Salzkammergut) at such a low price that it could be used to preserve a large variety of foods in wooden barrels and vessels. At times while unloading and loading along the many Rhine harbours, some barrels were damaged and left at a dump nearby. The theory of how it all started, I believe, is the one based on the curiosity and laziness of man. Bringing a woodfire kiln up to the sintering temperature for stoneware requires

Slip A (%): Kaolin 58,
ball clay 25, lithium
carbonate 8,5, titanium oxide
8,5. (See Image 1,5 and 6.)

a large quantity of dry wood shaped in thin sticks like the salt-soaked sticks from the dumped barrels. When the potter used them instead of wood from the forest, he noticed a glazing effect.

Based on that experience, the step of throwing salt directly into the kiln was easily taken. The glazing occurred automatically and the glaze ingredients cost less than lead glazes. Soon a large industry of salt glazed high quality stoneware arose in these areas and they began exporting to the rest of Europe, America and Africa. During the 19th century, salt glaze emerged in the UK and the North Eastern States of the US. In my opinion, the large scale production somehow blocked a more risky type of experimentation with the use of salt glazing. It was not until the beginning of the 20th century that independent ceramists in Europe, the United States and Australia, inspired by the Arts and Crafts movement, added many new twigs to the technology and the artistic way of using it.

One may ask oneself why the Chinese had not already invented the salt glaze. For centuries they had possessed the skills, kilns and the clay. Was the salt too expensive or did the thought of preserving food with salt not fit into the Chinese gastronomy?

Up to the 20th century there was no tradition of salt glazing in Denmark. The first experiments were done by Hermann and Niels Kähler in the 1930s and fine results were evident in 1947. The next generation of 'salters' was born in the 1940s including ceramists such as Bente Hansen, Hans and Birgitte Börjeson, Jørgen Hansen, Steen Lykke Madsen and me. All of us are still going strong and have won special prizes for salt glazing at the periodical *Salzbrand* exhibitions arranged by *Handelskammer Koblenz* or *Westerwaldpreis* at *Keramikmuseum Westerwald* in Höhr-Grenzhausen both in *Westerwaldkreis* in Germany. Both institutions encourage and promote salt glazed ceramics.

In 1989 I established a salt kiln at the School of Arts and Crafts in Kolding, Denmark and taught the techniques of salt glazing for a possible third generation of 'salters'. In 1998 International Ceramic Research Centre – Denmark was established, giving everyone an opportunity to have their works salt glazed.

TECHNOLOGY OF SALT GLAZING: The basic ingredients in an alkaline glaze are sodium, alumina oxide and silica oxide. The two last mentioned are major parts of all clays and refractory kiln materials.

Salt consists of sodium and chlorine – NaCl.

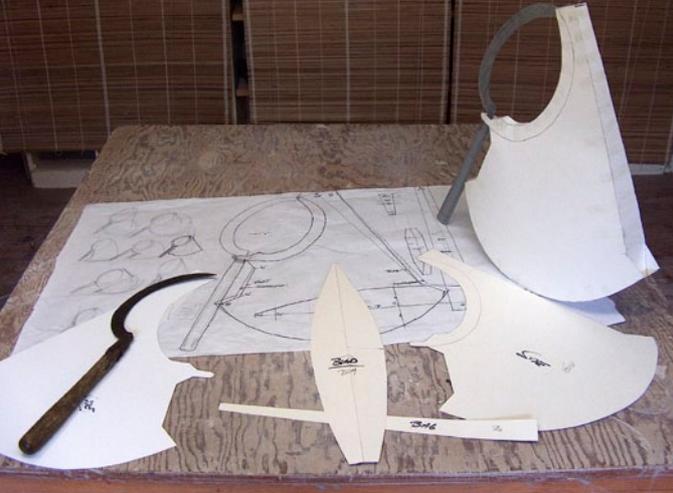
Introducing salt into the kiln at the sintering temperature of the clay, when the molecule grating is open, results in decomposition into sodium and chlorine. Chlorine is a poisonous gas but reacts very quickly with the water steam in the kiln, leaving the chimney as a light acidic water steam.

The sodium combines with the alumina, the silica in the clay and



Image 2: Lidded Jar with a Measuring Cup. Slip B. 23 cm/h.

Slip B (%): Kaolin 9, bentonite 1. (See Image 2.)



the walls of the kiln, building up a glaze on everything inside the kiln. The salt glaze itself is shiny and colourless and has to receive its colour from the clay, slip or glaze.

So why do I salt glaze (instead of glazing and firing traditionally) risking my works, polluting the environment, demolishing my kiln and my back by woodfiring? Well, for various reasons: The aesthetic of the colour development, the beauty of the orange peel patterns obtainable only by salt and soda glazing, the variation of flame exposure, the

distinct lining of edges and carved patterns, the loss of total control of the process and the result – all of which go hand in hand with my works and my temperament.

NEW LIFE TO FORGOTTEN TOOLS: Many years ago, when I was still throwing tableware, a silversmith visited me and asked if I could make him some boxes with small grips where he could work in some silver lockers. I made some boxes but he never showed up again. I went on working with the concept, using bamboo sticks instead; in the beginning as functional lockers, later on as graphic patterns combining the lightness of the bamboo with the gravity of the ceramic form. Other found objects such as driftwood from the seashore, (we have six thousand km of coastline in Denmark) teeth, old tools and odd fittings were added to my 'dictionary' (Image 1 and 2).

Today, I concentrate on sculptural slap built forms, though some of them carry reminders from their functional origins having small lids fixed by a tool (Image 8). Sometimes people bring me a tool of some emotional value to them and ask me to include it in a sculpture or an urn. During an Artist in Residence stay at The International Ceramic Studio in Kecskemet, Hungary a student christened my works *New life to forgotten tools*. I liked the poetic name and kept it.

FROM FOUND OBJECT TO FINISHED WORK OR MY WAY OF SALT GLAZING:

The entire process of creating a sculpture starts with a found, given or purchased object that inspires me. Then it is placed on my drawing table and a lot of sketches are elaborated until the 'right' form occurs. It must integrate with or almost absorb the object to become unified. Sometimes the object lends form or details to the sculpture, makes a contrast or serves as a lid or a lock.

The next step is to make a technical drawing from the sketch, taking into consideration that my clay has 10 percent shrinkage and that three-dimensional curved areas are bigger than the two dimensions shown by the drawing. The object must fit the sculpture after the firing. (If someone knows a computer programme able to calculate that, please let me know.)

The drawing, showing sides, top, bottom and important secondary details of the sculpture-to-be, looks like a cutting pattern for tailoring a jacket and is used as such. The parts are cut from cardboard and are taped together forming a 1:1 mock-up of the sculpture (Image 3). If it passes severe judgment, the creative part of the work is nearly com-



Top: Image 3: Sketches, drawings, model and cutting patterns for sculpture in image 6).
Above: Image 4: Introducing the salt over the top burner in front of the kiln.

plete. The rest is craftsmanship. Using a slap roller from a bakery, seven mm thick slabs are cut in a shape identical to the cardboard model and 'sewn' together. After scratching and mud gluing the slabs together, I make deep scratches diagonally over the joints. They look like a zipper and the plane of the marks looks like closing it. Different homemade bases – concave or convex – support the base during the work and different sizes of half spheres serve as tools to shape parts of the form. Smaller details are made by hand.

DECORATION AND SLIP GLAZING: I have done extensive tests trying out combinations of clays, fluxes and colouring agents on green, bone dry or bisque test tiles. I selected the ones working well at all three stages and ended up with very simple ones, which I use after a bisque fire. (See "A Way of Salt Glazing" by Heidi and Aage Birck, *Ceramic Review* no. 80. 1992.) However, the slip is only a part of the result. The various manipulations of the slip and different firing methods create many variations. You will find a list of slip recipes in the side bars of this article and references to them from the images.

To develop the 'spirit' of a salt glaze; the texture, the colour of the clay and slip, the contrasts, the sharp edges and decorative patterns, several other factors need to be taken into consideration:

The thickness of the slip: The thinner the slip is, the more the salt glaze will 'eat' its way through the layer of slips to the naked clay, making the characteristic pattern of orange peel and colour contrast between the slip and the clay. To benefit from these factors, I spray the slip two times covering the first layer partially with latex before spraying the next layer. All of the colour variations in one work are developed from one slip.

The firing: There are many factors to consider during a salt glaze fire, including:

- How the works are placed in the kiln according to the way the flames carry salt fumes through the kiln, wind and shadow sides.
- No kiln with open fire (necessary for salt glazing) has an equal flame flow and not two stockings of the same kiln give identical results. This is learning by doing, but you will find the pattern.

Recently I had to give up my Fred Olsen fast-fire woodfire kiln. 'She' was worn out and I am too old for that kind of firing. Now I am using an 800 litre Scandia Kiln (Denmark) with forced gas/air burners. Two burners are placed over each other firing parallel to the door and two burners are parallel to the back wall, making a down draft cyclone.

- The amount of salt introduced in the kiln. The more salt, the thicker the glaze will be and the more it will influence colour and texture. I



Image 6: (The sculpture shown in progress.) *Sculpture with a sickle*. 40 cm/h.

Slip Aa: the same as Slip A + 3% iron oxide. (See image 7 and 8.)

Slip C: Kaolin 66, Ball Clay 28, manganese carbonate 5, cobalt carbonate 1. (See image 7.)

Slip D: Kaolin 66, ball clay 28, rutile 5, cobalt carbonate 1. (See image 9.)

Slip E: Nepheline syenite 40, kaolin 30, ball clay 30. (See image 10.)

Slip F: Porcelain clay 9, zircon silicate 1. (See image 11.)



Above right: Image 7: Sculpture with a Knife (Slip C) and Sculpture with a spoon (Slip Aa). 25 cm/h and 56 cm/h, respectively.

Top left: Image 8: Lidded jar with a shuttle. Slip Aa. 87 cm/h.

Above: Image 9: Lidded jar with razor knife. Slip D. 26 cm/h

introduce fine table salt by compressed air through two porcelain pipes placed over the top burners in front and back of the kiln (Image 4). The different angles between the two give an even dispersion of the salt from top to bottom and it gives the fire cyclone an even distribution in the kiln. Thank you to Hans and Birgitte Börjeson, who taught me the trick.

– The temperature interval when the salting is done must follow the sintering interval of the clay. In my case, using a grey burning Creaton–Westerwald Clay No. 286, it takes place between 1240 and 1300 centigrade. One kilo of salt is introduced three times in front and back, amounting to a total of six kilos for a medium salting.

– The kiln atmosphere has a great influence on the result. I prefer reduction to oxidation as it develops deep, warm colours in my clays and slips. My slip containing titanium results in a colour scale from golden yellow to bluish green to brown mingled with the grey spots from the body shining through the slip (Cover image and Image 6). Regarding oxidation, the colours are more pale and dull. I use a medium reduction from 1000 centigrade to the finishing of the salting, controlled by adjusting the balance between the gas and air pressure.

Between the saltings, test rings are pulled out to control the building up of glaze and degree of reduction. The fast cooling of the test rings prevents the rings from showing the right colour. When working with

reduction, my clay gets a cold, grey colour whereas the colour turns beige during oxidation. Too heavy a reduction results in bubbles and the collapse of the clay and the kiln furnace. I have had this experience. It was at the cost of a month's work before I learned to dance with the new 'lady'.

The Cooling: After the last salting, the kiln is left to soak for one hour in a neutral atmosphere which adds a certain brilliance to the glaze. Then the gas is turned off and the blower allows me to lower the temperature to 1000 centigrade within one hour. The fast cooling prevents the glaze from oxidising. Then the blower is shut down and then I patiently wait for the kiln to cool down.

CONCLUSION: The ceramist has always been dealing with the basic elements: *earth* – clay and glaze minerals; *air* – the drying process and the draft in the kiln; *water* – plasticity of the clay and fluidity of glazes and slips; and *fire* to fulfil the transformation of clay to ceramics. Irrespective of one's skills, it is impossible to control the entire process 100 percent. Especially if one prefers extreme firing methods such as salt glazing, woodfiring, *raku* and saggar firing, one must be prepared for surprises when opening the kiln.

During the construction of my sculptures I have full control over the form. I can repeat them using my models. Even when I do my best to prepare them for a successful last journey through the fire, with all of the knowledge I have collected through 50 years, I find works which do not correspond to my expectations. They meet the hammer or end up in the row of works to be fired again.

But, once in a while I find a piece which is better than expected. I am not superstitious but it could almost seem as if someone gave me a helping hand. Of course the rational side of my ego takes over and I concentrate on finding an answer to the puzzle: How can I change this gift into a usable tool? The dialogue with the material and the firing process is a continuous education and development. This is the challenge and joy of being a ceramist.



Aage Birck was born in Copenhagen, Denmark in 1941. He established his first workshop in 1965 with his wife, ceramist and sculptor Heidi Guthmann Birck. From 1987 to 1998 he was associated with the ceramics department at The School of Arts and Crafts in Kolding, Denmark. He has had several exhibitions and works in collections in museums in Europe and in the US, Taiwan and Japan.

Recently he won the salt glaze prize at Ceramics of Europe: The 12th Westerwald Prize 2009 shown at *Keramikmuseum Westerwald*, Höhr-Grenzhausen, Germany from 28 August 2009 to February 2010 and at The Danish Museum of Ceramics in Middelfart from March to June 2010. (www.aagebirck.com)

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Image 10: Sculpture with Drift Wood. Slip E. 37cm/h.

Image 11. Sculpture with whale penis bone. Slip F. 71 cm/h.

Collection of The Danish Museum of Ceramics in Middelfart