Forming Metal with Aquaplast:

A Research Perspective

Susan Amador

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The Spring of 1995, I attended the Washington,DC. SNAG Conference as a Minority Student Fellowship recipient. There, Dave Pimental's raising workshop included an introduction to Aquaplast, a hand-moldable plastic with many applications to metalsmithing. The material was intriguing as a possible replacement for the conventional uses of pitch and the spontaneous forming of raising stakes, in any shape desired.

An added feature was the plastic`s shock absorbing abilities. The prospect of reducing impact stress on the elbow from hammering was seductive to an older person, newly recovered from tendinitis.

I sent for some pellets (**Photo 1**) and sheet to the WFR/Aquaplast Corp., 30 Lawlins Park, Wycoff, New Jersey 07481-1443 (phone:1-800-526-5247). The plastic was easy to use: place it in almost boiling water until it turns from white to clear, then remove and mold with your hands. If it sticks to your hands, use a little lotion as a release agent. I used the pellets the most for making stakes. The pellets seemed to have less memory when reheated than the sheet, which kept vestiges of its corners and edges when reused. The sheet was better utilized as coatings and covers for Delrin, metal and wood stakes to protect them or soften their metal moving qualities and effects on joints.

I began by experimenting with the Aquaplast as a pitch replacement

Photo 1. Aquaplast pellets.

Photo 2. Aquaplast and sugar spoon with horn stand.

and quickly found that the material did not adhere to the metal at room temperature and had no give at all. While this did not preclude other uses, it did give me a taste of what the material could and couldn't do. I use pitch in raised vessels to chase the exterior and the plastic didn't apply to the detail and scale of my work. Aquaplast's lack of spontaneous flexibility and bonding ability didn't support the metal from the interior as pitch does to allow for intricate chasing and deep relief. But, the Aquaplast's non-adherence was a plus in other approaches. A sugar spoon with a protruding rest made of horn needed chasing from the front. Pitch would certainly stick to the piece, and would be almost impossible to remove from the horn when released. I heated a handful of pellets, squeezed out the water, pushed the spoon into the hot plastic and left it until it had cooled. The plastic formed perfectly to the spoon, didn't stick and supported the work while being chased (Photos 2 & 3).

Another application came up when a stake extension arm broke at the top and was useless. Using enough plastic to mold around a 15 inch piece of 1/2 inch round steel stock and protrude an inch or so around the outside diameter of the rod, the anvil head was pushed into the hot plastic. As a cooler skin formed, the stake is suspended under running cold water to set more completely. This formed a stake extension that held up to as much (or more) hammering as the metal one had (Photos 4 & 5). The anvil heads with similar chucks were exchangeable, as well.

Photo 3. Sugar spoon in Aquaplast support form, ready for chasing.

Photo 4. Aquaplast as a stake extension arm.

Photo 5. Aquaplast as a stake extension arm.

Then I used the plastic to raise a spout from the vessel I was working on at the time, a fine silver creamer.

I had some pictures from a Japanese metalworking text (illustration 1) that portrayed the process of raising an enclosed spout from a volumetric form. The work was done from the edge down, hammering towards the worker. While I used the pictures to support the idea that the spout forming was possible, I didn't take the directional movement of the metal, as per the Japanese working methods, into consideration.

The process involved raising on metal stakes until the stake's form wouldn't fit the interior of the vessel's shape, then switching to the plastic, molded each time to fit the situation and changes of the vessel form. The plastic was formed around the top portion of a 1/2 inch steel rod stake, (the top 2 inches were bent at a 90 degree angle). As the work proceeded, the area to be cut out became very thin and cracked in several places. The conventional Western approach to raising by hammering away from yourself to the edge was the culprit. Fortunately, the top of the spout was to be cut out, with an inch of the vessel`s rim remaining. I studied the Japanese drawings and realized the depicted form was raised the opposite direction from the way I was habituated to work. The final result was what I had hoped, an integrated spout, without the problems of separateness experienced with attached spouts.

Illustration 1. Japanese Metalsmithing Text

The next experiment was an enclosed spout. I began with a 12 inch disk of 18 gauge of copper, raised a few rounds and then started to hammer a protrusion around the plastic stake, molded to the shape I wanted the bump to take. I used a 1/2 inch piece of rod stock, bent into an L-shape as a support for the plastic, chucked up in a vise (Photo 7). I used the illustrations from the Japanese text, showing the progression of a teapot with the spout raised from the vessel and attempted to reverse my Western thinking about what was presented in the pictures. The photos showed their raising procedure started from the top and hammered down, developing the bottom last. I incorporated this into the raising technique I was stuck on by analyzing the Japanese text and translating that into my raising. What I ended up with was a combination of techniques, that at first felt very foreign and brain tweaking. Interpretation of the pictures without translation of the written text felt half-baked and being a kinetic learner, I wavered minus demonstration. If they raised from the top down, then metal was building up around the spout bud, enough to enclose it eventually, and raise it up and out. I tried to judge the distance down the vessel wall to start the bud, so it would end up where it needed to be, using the Japanese diagrams. The process was similar to the one used for the creamer spout, a combination of metal on metal stakes and hammers, metal hammers on plastic stakes, rawhide mallet for bouging and an occasional oak raising hammer on metal or

Photo 6. Hammers, stakes and equipment.

plastic stake(Photo 6). I would work on the spout area, then raise the vessel holistically. After several courses of working the copper down onto the plastic stake, the body of the vessel would distort and eventually a complete round of raising, metal on metal, was necessary to stabilize the form. The difficulty was in projecting where the complete raised courses would take the form and how to manipulate them to fit the form designs.

I couldn't have done it in the time it took me if I had to carve wood stakes to fit each progression; the plastic worked quickly and held up to the hammering, although more consistent, potent movement is obtained with metal on metal hammers and stakes.

Photo 8 shows the copper piece in the beginnings of bud formation on the stake shown in Photo 7. To thicken the copper above the spout bud, I always raised from the top down in the area above the protrusion. The area above the bud would thin and thicken again when I closed in the form later. Another thickening method I used was to avoid hammering directly on the inner area of the spout bud, until much later in its development. Photos 8 and 9 depict further bud formation, while Photo 10 shows the stabilizing complete course after the bud forming distorted the vessel.

Photo 11 shows the reformed plastic stake, with supportive sides to correct distortion. Each time the plastic was reheated and reformed, it developed more and more memory for the shape that went before and it

Photo 7. Aquaplast stake, molded onto L- shaped steel rod.

Photo 8. Spout bud begun, using stake in photo 7.

Photo 9. A little further along.

Photo 10. More developed.

Photo 11.   A new plastic stake, with supportive sides.

became increasingly necessary to reinforce the molded shape with your hands until the stake partially cools. The cooling time ran about 15 to 30 minutes depending on the amount of plastic used and could be accelerated by running the half-cooled stake under cold water. The very hot plastic continues to deform until the surface cools and hardens. Photos 12 and 13 show the formation of the spout stake to include the undercut for the top portion of the spout.

At this juncture, further formation of the spout was developed by closing the vessel in and raising the body of the form away from the spout bud (Photo 14) before hammering on the spout itself. Several courses of planishing, in between raising rounds, provided uniformity and stabilized the vessel. Tiny cracks developed on the sides of the spout, and one side had a thin area. This was from uneven thickening in the places on the sides of the spout bud and raising courses in one direction, hopping the spout area to begin on the other side, that pushed the metal towards the bud on one side and away on the other, thereby thinning and stressing it irregularly.

The Aquaplast`s quality of softening in hot water lent well to forming the stake inside the closed-in form, (because the diameter of the top rim prevented the insertion of the stake), to be removed later by hot water softening. (Photo 15)

The metal in the spout had thickened from 18 to 14 gauge and moved

Photo 12. A new stake shape with an undercut for the spout top.

Photo 13. Even more undercut.

Photo 14. The vessel closing-in, raised away from the spout bud.

Photo 15. Stake formed from warm plastic inside the vessel and the end of the spout cut away.

Photo 16. The spouted form, close to completion.

slowly, with many annealings. Photo 15 illustrates the spout with the end cut off that allows for release of tension in the thickened copper and access to the spout with a metal spout stake. Photo 16 shows the spouted form, before completion of closed-in diameter and extension of the spout.

A lot of what I learned was where <u>not</u> to use the plastic, how to push the form on metal stakes as much as possible before utilizing the Aquaplast, plus the importance of frequent annealings.

My journey with the Aquaplast has just tipped the iceberg; this material is an invaluable, permanent tool in my studio's repertory. I expect to find new and improved uses for the Aquaplast that will make metalsmithing easier and save time, (after all, time is money). I encourage correspondence via E-Mail at suamador@lamar.colostate.edu and any information on other applications of Aquaplast to metal work. Using the plastic in volumetric form production has opened an endless panorama of possibilities for design concepts, that have been limited by the time constraints of progressive stake formation in other materials.