Archaeological Preservation Research Laboratory Report 6:

Conservation of 17th Century Canvas Using Silicone Oils

C. Wayne Smith

D. L. Hamilton

Conservation Research Laboratory

Texas A&M University

The excavation of Port Royal, Jamaica has uncovered a great number of well preserved organic artifacts that would not be present, or at least as well preserved, in a terrestrial site. This is the result of a deep silt layer that has protected the majority of the site for the last three centuries. Artifact PR90 2074-17 is such an artifact. When recovered, this gudgeon plate was heavily concreted, looking more like a long rock than a ship's fitting. During the initial phases of conservation, we were delighted to note that a long strip of canvas had been used as a backing behind the gudgeon plate, along with a thick layer of pitch. After the outer layer of concreted material had been removed from the artifact, it was a simple task to slowly separate the canvas backing from the surface of the plate. Once removed, the cloth and plate could be treated using appropriate conservation strategies that would allow for reassembly and documentation.

Microscopic analysis of the canvas indicated that the backing had been made from cotton canvas material, that had been crudely cut to follow the shape of the gudgeon plate. Two squared holes were present in the section that was to be treated using silicone oils. These holes lined up with the remains of two large bolts, that would have been used to fasten the gudgeon plate to the hull of the vessel. The warp of the fabric was counted at 20 strands per inch while the weft averaged 16 strands per inch. The variance in warp and weft counts as well as the generally uneven shape of the strands suggests that this was probably a common, though sturdy material.

Once removed from the back of the gudgeon, the canvas was placed into a vat of fresh tap water and the surfaces of the cloth were lightly cleansed using finger tips to remove loose debris and concretion. The fabric was initially placed into a vat of acetone which successfully removed traces of pitch that were imbedded into the weave of the fabric. After several rinses of fresh water, which were used to remove salts and any remaining acetone from the fabric, the canvas was then placed into a 5% solution of hydrochloric acid in water, to aid in the removal of rust stains. This process was very successful in removing minute specs of concretion and iron stains from the fabric and after treatment, the cloth was immersed in several fresh water baths to get rid of any remaining acid.

Once concreted material had been removed, the fabric was placed into a 5% solution of hydrogen peroxide for a brief period of time as a means of removing heavy sulfide stains that were present. The fabric was rinsed and stored in fresh water before silicone bulking.

After cleaning, the fabric was placed into an acetone bath, to dehydrate the material in preparation for silicone bulking. To aid in the removal of any remaining water, the container holding the fabric in acetone was placed into a vacuum chamber and a vacuum of 28 Torr was applied until all bubbling ceased. At this point, all remaining water had been removed from the artifact. The fabric was then quickly placed between two sheets of lint-free paper and blotted to remove acetone from the fabric. After blotting, it was quickly placed into a large beaker containing 500 milligrams of PS341 silicone oil. A mesh screen was then placed on top of the fabric as a means of keeping the cloth suspended in solution throughout the bulking process. The beaker was then placed back into the vacuum and as before, a vacuum was applied to the fabric for two hours. It was noted that vigorous bubbling ceased after twenty minutes and no bubbles were noted after one hour of applied vacuum. The fabric was allowed to sit in solution and slowly returned to ambient room temperature where it remained for 48 hours (the next class period).

Prior to removing the fabric from the silicone oil solution, a warming oven was preheated to 120 degrees Fahrenheit. As in many of our other experiments, a containment chamber was created by placing an inverted polypropylene pail with a tight fitting lid into the warming oven. In the center of the lid (acting as the base of the chamber), a flat dish containing 2 ounces of CT-32 catalyst was placed in the chamber. A large mesh screen was placed over the dish to act as a platform on which the fabric could be placed for exposure to warm catalyst fumes (Figure 1).

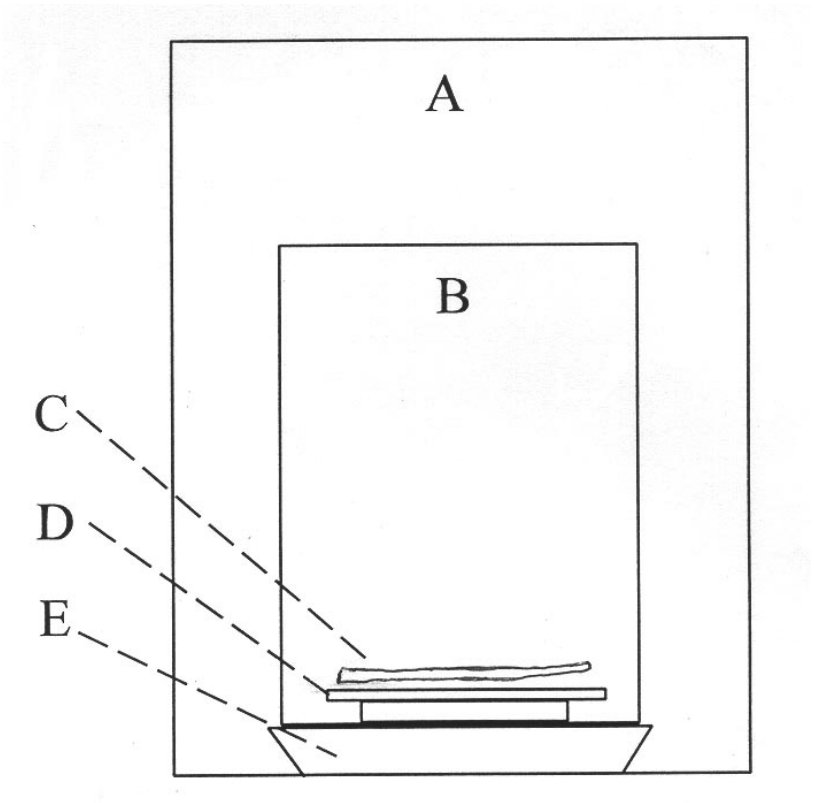

Figure 1. Set up for polymerizing canvas gudgeon material.

A Warming Oven
B Containment Chamber
C Canvas Fabric
D Mesh Screen Support
E Catalyst Tray

After removing much of the free-flowing silicone oil by suspending the fabric over a stainless steel dish and allowing excess silicone to drip from the material, the fabric was then placed between two sheets of newspaper and lightly pressed to remove additional oils. With much of the free-flowing silicone oils removed, the fabric was placed onto the screen in the containment chamber where it was exposed to catalyst fumes for 24 hours. After 24 hours, the catalyst had become hard as a result of silicone oils dripping into the dish, forming polymerized material. A new tray containing 2 ounces of catalyst was placed into the containment chamber, and the process was continued for an additional 24 hours.

After two days of polymerization, the fabric felt slightly damp, but had retained the look and feel of cotton canvas material. The warming oven was turned off and the fabric was left in the containment chamber at room temperature for an additional 24 hours. After a total of three days, the fabric was removed and allowed to "air" undisturbed on a sheet of white paper.

Observations

The processes used for removing embedded concretion and stains from the cotton canvas are conventional conservation processes that are widely used in the treatment of stable fabrics. Care was taken to thoroughly rinse the artifact prior to bulking with silicone oils since the effects of interaction between theses materials are not known. Because of the porous nature and loose weave of the fabric, it was perceived that there would be no

difficulty in the dehydration and subsequent bulking of the material with silicone oils. Subsequently, it was decided that it was not necessary to drive off acetone using the longer process of applying a vacuum to the fabric in a freezer-mounted vacuum chamber.

Pre and post treatment documentation indicates that no shrinkage has occurred in the fabric. More extensive treatment in acetone prior to silicone bulking may have eliminated more of the discoloration in the fabric, but traces of any diagnostically important staining remains in the fabric, and the fabric is both flexible and stable. Placing the treated canvas was the simplest means of determining the degree of polymerization that had occurred in the sample. Since oil spots were not noted, we can be sure that all of the oils used to bulk the fabric have been polymerized within the fibers of the cloth and therefore, stable.

Citation Information:

C. Wayne Smith
1998, "Conservation of 17th Century Canvas Using Silicone Oils", Archaeological Preservation Research Laboratory (APRL), Report 6, World Wide Web, URL, http://nautarch.tamu.edu/APRL/report06.htm, Nautical Archaeology Program, Texas A&M University, College Station, Texas.