TEXTILE CONSERVATION ISSUES: DRY-CLEANING AN HISTORIC TEXTILE

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ABSTRACT - Dry-cleaning at a commercial facility can be a viable option for textile conservators when reducing oily particulate soils from an historic textile. A nineteenth-century livery coat, made from a fulled wool, a plain-weave wool, silk decorative braid, and metal buttons, was tested and prepared for dry-cleaning within the textile lab of Winterthur Museum. The three-dimensional shape of the coat and the individual elements (the braid and buttons) were protected and supported by generous amounts of nylon netting secured with a cotton thread. Perchloroethylene (C_2Cl_4), currently the standard solvent within the dry-cleaning industry, was used in a manually controlled dry-to-dry unit. A 0.5% charge of a commercial non-ionic surfactant was added to remove unoxidized water-soluble soils. This case study illustrates some of the issues and practicalities involved when solvent-cleaning historic textiles.

1. INTRODUCTION

This livery coat was made for a footman in the household of Prince Klemens Lothar von Metternich (1773-1859), a shrewd Austrian diplomat and statesman who influenced an age of politics through his ultra-conservative beliefs. It is currently owned by the Philadelphia Museum of Art and was treated in the textile conservation lab of Winterthur Museum as part of the Winterthur/University of Delaware Program of Art Conservation. Using information derived from the materials, and both original and non-original construction and heraldic designs on the buttons, the provenance was confirmed and the date of the costume was determined to be no earlier than 1813 and no later than 1829.

In 1813, Metternich was at the height of his power as Austrian foreign minister during the reign of Emperor Franz I. As a dominant political figure in Europe, he negotiated with Napoleon of France and Alexander of Russia, helped to arrange the marriage of Napoleon to Marie Louise of Austria, and played a major role in the creation of the European coalition after the fall of Napoleon. He was also despised and eventually driven from power by the students and liberals who participated in the Revolution of 1848. His high social and political status would demand that his household be outfitted with an identifiable uniform.

2. DESCRIPTION

The livery coat's classic style and military flavor is typical for the late-eighteenth to mid-nineteenth century (figure 1). It has a pigeon-breasted shape with a high, stiff collar, coattails, and cuffed sleeves. It is constructed of yellow fulled wool and lined with a yellow 1/1 plain-weave wool. The collar has an interlining made of a coarse, plain-weave linen. The fibers of the interlining were very stiff, probably from a starch or hide glue which was commonly brushed on for added stiffness. The sleeve linings are an undyed linen. Two widths

(three inches and two inches) of a looped and voided velvet braid made from brown, white and gold silk are laid side-by-side to decorate the collar, front lapels, sleeves, pocket flaps, coattails, shoulders and back of the coat. The designs created by the braid occupy the majority of the surface area of the exterior of the coat. Proportionately, very little of the yellow wool remained visible.

Each sleeve had four stripes made from the three-inch decorative braid. They were spaced evenly between the shoulder and the cuff. A fifth stripe was partially hidden by the five-inch cuff. The cuffs were constructed of brown cotton cut velvet with the two widths of braid tacked down to it. Remnants of an undyed lace were evident in several places on the interior of the cuffs. The cotton lace was attached with a black cotton thread.

The central motif of the braid appeared to be three drop-like designs encircled by laurel wreaths. Under careful inspection (Kraak 1996), they were apparently a repeat of the three scallop shells (trois coquilles) which occupied the principal area of Metternich's heraldic crest, which was also found on the livery coat's buttons. The braid also followed the tincture of the crest: the scallops were sable (black) and the ground was argent (white or silver).

A total of twenty-one large buttons decorated the jacket. The stamped design on the French-plated brass buttons depicts the heraldic crest of Prince Metternich. Five buttons were originally found at the front lapels (two are presently missing), three at each cuff, three at each pocket, two at the top of the coattails and two at the bottom of the coattails. The majority of the buttons were functionless; only three buttonholes were cut in the front lapels (figures 1 and 2). Twenty buttons were believed to be original to the coat. Each of these buttons have "T. Shaw London" stamped on their backs. Thomas Shaw was a London button manufacturer from 1809 to 1829 (Nayler 1992). The soldered Omega-style shanks of these twenty buttons punctured both the fulled wool and the braid and were firmly attached with a Z2S linen thread (two ends spun Z are plied S). The button threads were hidden behind the lining of the coat, indicating the sequence of original construction.

One button, believed to be a later replacement, had a slightly different design scale, more intact plating, and a different maker-mark than the others. It was stamped with "H & S Best Quality" which indicates the button was made by Harrison & Smith, from London, 1883-1899 (Nayler 1992). It was attached by stitches of cotton thread (insufficient length of thread available to make ply/twist determination) which were visible on top of the lining, indicating that it was attached after the original construction. One explanation for the late date of the button might be that someone, understanding the significance of this coat, had the button made to match the others.

The projected range of dates for the livery coat was 1813-1829, based on construction details, the historic reference for the heraldry on the buttons, and the dates of the button manufacturer.

Dating this coat by style was difficult since livery uniforms had become a static design. The style was considered fash-

Figure 1.

Figure 2.

ionable in the late 18th Century, but changed little over the years and became a standard design.

Dating information can be derived from the original construction details and the buttons (figures 3 and 4). The buttons were attached with a linen thread, as were all parts considered to be part of the original construction. Only the repairs, the replacement button, the hook and eye, cotton lace remnants, and the hanging tab were attached with cotton thread. While cotton thread may have been available through trade with the Middle East and Italy at this date, it was probable that it was used only on areas of later additions.

Historical reference from the heraldic crest on the button supplied the earliest date of 1813. In 1813, Franz I of Austria awarded Metternich the augmentation of honor, making him the Prince of Austria. This allowed Metternich to quarter his arms with the imperial crown. Imperial heraldry elements appeared above the central shield of the buttons, indicating that Metternich had already been awarded this honor when the buttons were made. The twenty original buttons, all with the maker's mark "T. Shaw", were made no later than 1829 which was the latest date of the manufacturer.

3. CONDITION

In examining the livery coat, it was apparent that overall it was in good condition. The fulled wool was still strong and showed only minor areas of thinning where the weave structure of the fulled wool ws visible. The coat had an overall gray cast to it which was probably due to oily particulate soils, commonly carried in the ambient air, settling on the coat over time. There were areas along the coat tails of heavy soiling and small areas of loss due to insect damage and wear. There was a tear on the lapel where one button had been lost. The braid had become detached in several areas probably due to the contact between the cellulosic thread with the acidic, proteinaceous wool and silk. Sections of the braid were worn or abraded from use or storage. It was unknown if any previous cleaning had been performed on the coat.

4. TREATMENT

The Philadelphia Museum of Art wanted the livery coat to be cleaned for possible future display. Determining the most appropriate cleaning treatment for an historic textile involves multiple issues including the textile's fibers, construction, physical strength, finish, dyes, decoration, history, and type(s) of soil(s) present.

Because the soil looked to be oily particulate soil, rather than water-soluble soil and because of the multi-layer construction, it was decided to dryclean the coat. Dark staining at the coattails was an oxidized water-based stain, unlikely to be reduced in any cleaning system. Petroleum distillates, such as Stoddard solvent, and synthetic solvents, such as perchloroethylene (C_2Cl_4), are currently used by commercial drycleaners. Perchloroethylene, also known as perc, PCE and tetrachloroethylene, is the solvent used more commonly by dry cleaners in the United States. Perchloroethylene is a non-polar solvent. Its future use in the dry-cleaning industry is in question due to the 1990 Clean Air Act.

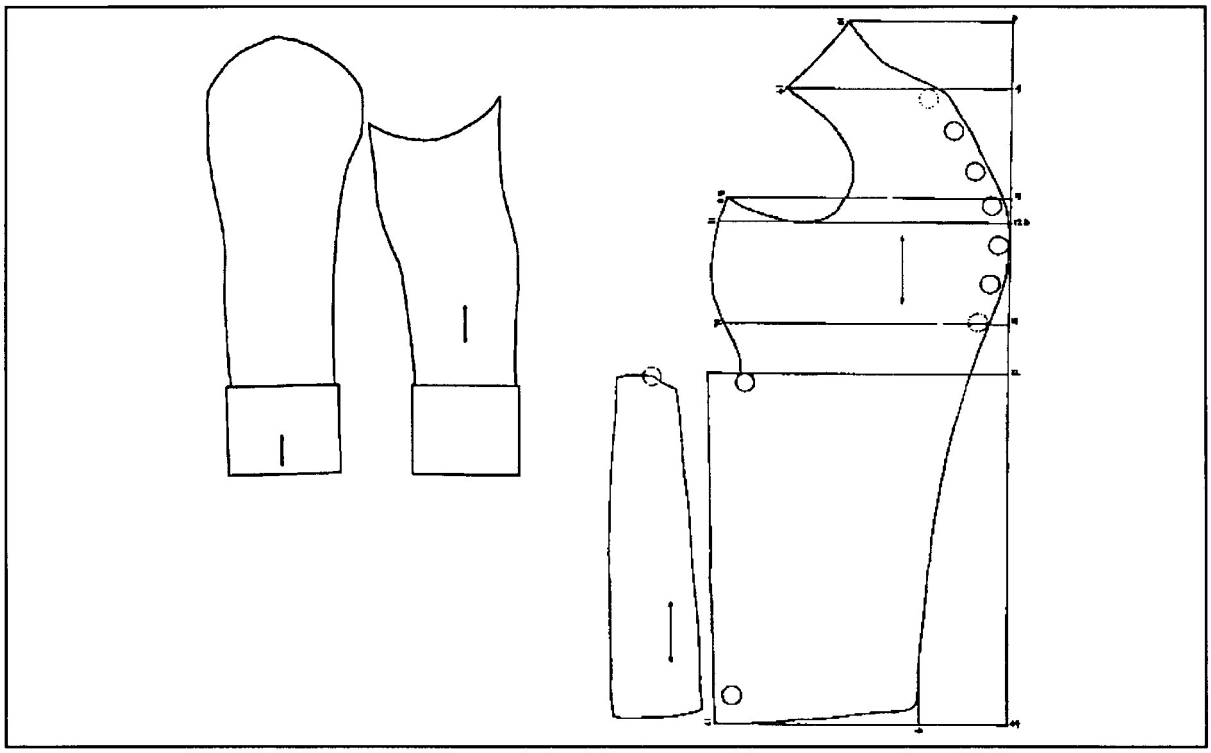

Figure 3. Proper right (pattern drawn by V. Whelan)

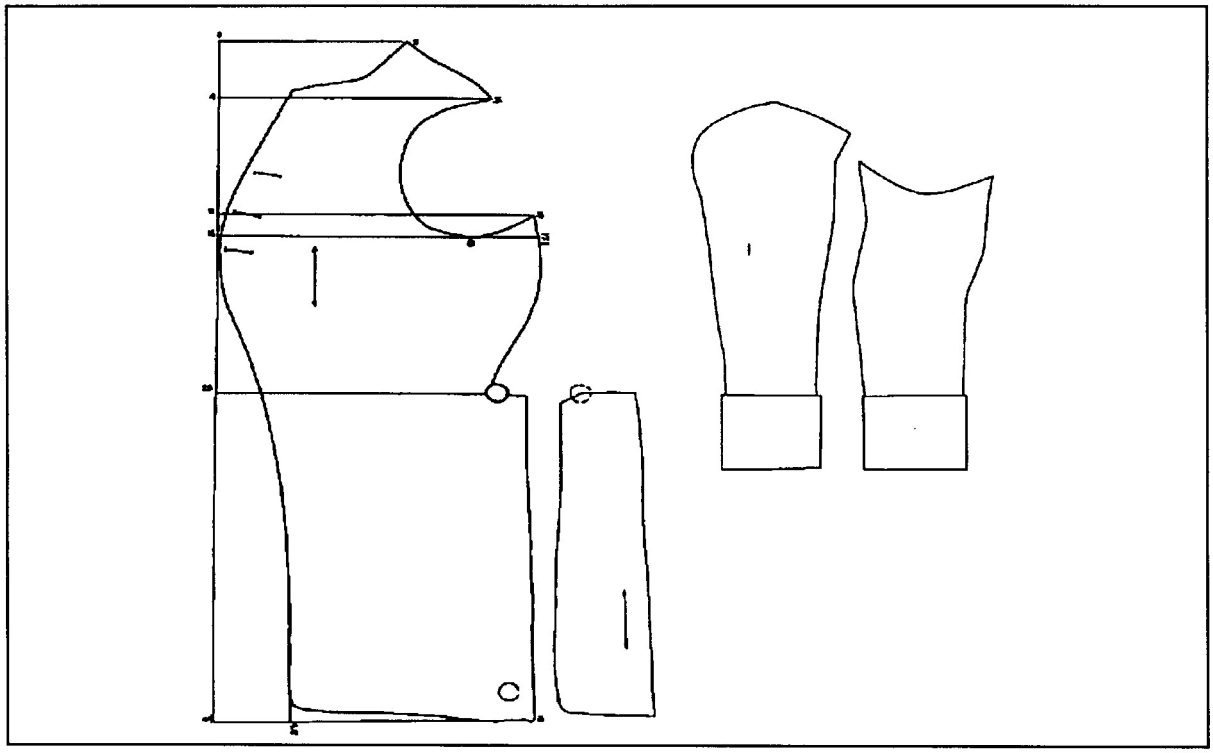

Figure 4. Proper left (pattern drawn by V. Whelan)

After testing revealed the dyes were stable in perc, the coat needed to be prepared for dry-cleaning. There were two goals of the preparation. First, the weaker elements of the coat needed support to withstand the mechanical action of the solvent. Perchloroethylene is almost twice as heavy as water and the force of the solvent hitting the textile and pushing through the fibers during the cleaning process is significant. Second, the coat needed to have proper support to minimize uncontrolled movement within the dry-cleaning machine.

Detached portions of braid were secured to the fulled wool. The braid, when folded over on itself, was extremely resilient. The tools of choice to get the job done with a minimum of puncturing of the textile or fingers, were a thimble, a curved needle and hemostats. A fine thread pulled from Stabiltex, a plain-weave polyester fabric, was also used. The hemostats, a surgical tool for cauterizing veins, was used to push the needle into and then pull the needle out of the textile.

Bit by bit, the entire coat was sandwiched between two layers of netting held in place with large herringbone and running stitches made with a white, mercerized cotton thread. Nylon netting was chosen because it allowed the solvent to pass through to the textile, yet was strong enough to endure the mechanical action of the process and solvent. Pouches of netting were sewn around each button to protect the textile from the metal button and to protect the button from abrasion by the metal drum. Stitches were placed in areas of strength in order to support weaker areas. Special care was used to stitch over the edges of the braid to give them extra support. As mentioned before, the mechanical action of the solvent could cause damage to the already brittle thread. Generous wads of nylon netting were stuffed inside the arms, neck, and chest area of the coat to help maintain its shape during cleaning. In order to fit the coat into the dry-cleaning machine, the tails of the coat were gently rolled forward over the padded-out chest area, making sure there were no harshly folded portions. A large bag of nylon netting was securely sewn around the padded-out coat in order to keep it in this position during the cleaning. The dimensions of the bundle were checked to make sure it would fit within the door and the drum of the dry-cleaning machine.

Three-dimensional textiles and large, flat textiles can be prepared similarly. Robin Hanson, a classmate and fellow textile major, prepared a Turkish prayer carpet for dry-cleaning. The carpet, also owned by the Philadelphia Museum of Art, was approximately 4 feet by 6 feet. The entire carpet was sandwiched between netting; the fringe was held between the netting by running stitches while the appliquéd elements were held with herringbone stitches. The carpet was wrapped around one-inch loft polyester batting in such a way that no two layers of the object touched each other. This was done to allow the solvent to reach and drain from the inner portions of the package. The carpet was encased in a nylon netting bag to limit movement within the drum.

A particular Delaware dry cleaner was chosen for several reasons. First, the company was a high-end dry cleaner and accustomed to caring for finer textiles. Second, the owner was enthusiastic about work-

ing with Winterthur Museum and was willing to accommodate our requests: manual control of the movement of the drum of the machine was necessary, and we needed freshly distilled perchloroethylene, preferably the first batch of the day. We were allowed to dominate his equipment for the morning with only one object in the drum at a time. And lastly, this dry cleaner had done an excellent job in the past on similarly prepared historic textiles from Winterthur Museum.

The prepared textile was placed in the Miraclean Rock 35i dry cleaning unit which is a dry-to-dry unit. Twenty gallons of perchloroethylene were added to the drum and the coat soaked for five minutes on one side. The drum was manually moved to flip the coat once to its other side for an additional five minutes of soaking.

Since not all the soils on the coat were solvent soluble, 0.5% charge of a commercial detergent was added to the perc. A "charge" is the term used to describe the amount or concentration of detergent added to the non-polar solvent. This slight addition of water in a surfactant should remove unoxidized water-soluble soils without harm to the coat. A non-ionic detergent without any additives would have been ideal, but because of the method of injecting the charge into the drum, we had to choose between one of two commercial detergents. According to the Material Safety Data Sheets (Fabritec International 1995), one detergent solution included a sizing, and the other included an optical brightener. The detergent with the sizing was immediately eliminated, and the detergent with optical brighteners was less-than-enthusiastically chosen as the charge.

The coat was flipped several times by manual controls on the machine. The fifteen gallon solvent rinse was extracted by first spinning the coat within the drum. It then volatilized when the temperature was raised to 140°F (57°C) for twelve minutes. The drum was allowed to cool down for half an hour before we opened the door.

The coat was moved to the reclaimer unit where warm air (130° F) was cycled in. Vented air was funneled to a carbon filter that adsorbed any volatilized perchloroethylene. After forty-five minutes, the coat was removed and the support bag opened. There had been a significant reduction of the overall, oily particulate soiling that had made the coat look gray. The dark, oxidized water-based stains remained, as we expected. The stiff, brittle hand of the coat had changed to a softer one. The silk braid had a sheen to it. The results were very gratifying. Unfortunately, the cross textile conservators must bear is that photography rarely captures the visual difference before and after treatment. However, everyone who had witnessed the cleaning was amazed by the positive change.

It took 63.5 hours to prepare the coat for treatment, eight hours to remove the netting, and just 1.75 hours of treatment at the dry cleaners. The time intensive preparation of the textile might seem disproportionate. But the intention was to err on the side of caution and minimize any conceivable risk. It is important for textile conservators to understand the possibilities and limitations of using a commercial dry cleaner. It is hoped that this case study will continue the discussion about commercial dry cleaning as a viable treatment option for historic textiles.

APPENDIX A

Nylon netting: 20 Denier monofilament bobbinet, Dukeries Textiles, Nottingham, England

Polyester batting: thermally bonded 100% polyester batting, Museum Services Corporation, Burnsville, MN

Additive 8890 Supreme: Fabritec International, Cold Springs, KY

NOTE:

1. In 1829, T. Shaw made army, navy, livery and foreign buttons. The business listing under 'Shaw' lasted from 1829-1844 under other names: S.E. Shaw, R. Shaw, E. Shaw and Richard Shaw (Nayler 1992).

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