Pemulen Case Study: Holy Innocents Mural Project

by Kirsten Travers, Richard Wolbers, and Carolyn Tomkiewicz

Figure 1.
Ave Maria Mural at Holy Innocents Church, before treatment.

Pemulen TR-2 was an integral part of a three-step cleaning process designed for Taber Sears's *Ave Maria* mural (c.1923), adorning the left wall of the transept of Holy Innocents Roman Catholic Church in Brooklyn, New York. The painting measures 11' x 10' and is adhered to the masonry wall with what appears to be a lead white adhesive. Although the mural was in good structural condition, the image was obscured by a thick layer of soot, presumably from a 1977 fire in the church that was trapped beneath a thick layer of alkyd varnish that left the surface almost completely black (fig.1).

Under the direction of Richard Wolbers, associate professor and adjunct paintings conservator (WUDPAC) and Carolyn Tomkiewicz, paintings conservator (Brooklyn Museum of Art), examination, analysis, and treatment of the mural was carried out in stages from January 2009 to May 2010 by graduate students and PhD fellows at the Winterthur/University of Delaware Program in Art Conservation (WUDPAC). Kirsten Travers was the lead conservation fellow for whom the mural served as an analysis/treatment project for her second year Painted Surfaces curriculum.

Analysis revealed that the original painted surfaces consist of an 'emulsion' paint made with oil containing dispersed phases of protein and carbohydrate moieties. This suggested that water sensitive/soluble material was potentially present. The original paint layers were coated with a thin layer of natural resin varnish, which may have been applied by the artist. A distinct layer of soot was deposited over the surface of the varnish, probably the accumulation of incense and candle smoke as well as soot from the 1977 fire. This was followed by a very thick alkyd resin coating (identified by GC-MS analysis, L. Kubick 2009). It is not known when the alkyd resin was applied, but the intention may have been to re-saturate the soiled mural following the fire. Large areas of the painting were apparently abraded during this campaign of restoration; scattered retouchings were found directly underneath this alkyd coating, which "trapped" the underlying retouching/soiling materials. Over time, the alkyd coating discolored and an additional accumulation of soiling materials were subsequently deposited on its surface, effectively creating a soot-alkyd-soot "packet" that obscured the bulk of the presentation surface of the mural (fig. 2).

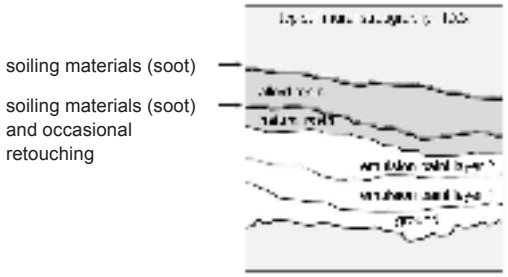

Figure 2. Illustration of the typical mural stratigraphy.

A variety of approaches were tested. Taking into account the moisture-sensitivity of the original paints, we decided to "unpack" the trapped soiling/retouching layers and discolored resins in stages primarily using solvent gels and secondarily using aqueous systems. With their high viscosity and ability to work exclusively on the surface gels provided optimal control while keeping solvent fumes to a minimum, a benefit for the conservators, the mural, and the congregation, as the church was in use during this time. After extensive testing, we found that a 3-step method consisting of (1) solvent gel, (2) Pemulen, and (3) solvent gel was extremely effective. Large areas (approximately 1' x 1') could be cleaned evenly and without tide lines, and in a manner rapid enough to accomplish a great deal of work in one day. After the initial removal of the uppermost soiling materials with Shelsolv D-38 on cotton pads, the cleaning was accomplished in the following manner:

Step 1: To remove the bulk of the alkyd resin, a 2:1 benzyl alcohol/acetone solution was gelled with Carbopol 954/ Ethomeen C-12. This was brushed onto the surface and allowed to dwell for approximately 20 minutes, or until a distinct "crinkle" pattern was observed on the surface. The alkyd was then agitated with a short, stiff bristle brush, stirring up copious amounts of swollen, discolored resin along with overpaint and some of the trapped soot, which we wiped from the surface with cotton pads and rinsed with Shelsolv D-38. Although most of the alkyd was removed, a dark veil of tacky, swollen residues remained (fig. 3).

Figure 3. During treatment detail. The alkyd resin has been removed from the angel's head and neck, but residues remain. [The gilt halo was cleaned using a separate system, not described here.]

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Step 2: Pemulen TR-2 gel (1% polymer in deionized water, neutralized with triethanolamine) at a pH of 8. was used to remove the tenacious alkyd residues and the underlying soot. A thin layer of this gel was brushed onto the surface, gently agitated, and wiped dry with a clean cotton pad. As an emulsion-forming polymer, Pemulen can bring together both aqueous and solvent phases in a stable arrangement without the use of surfactants. It is this emulsion-forming property that was effective at this stage to pick up the residual alkyd coating left behind after the initial gel cleaning step, as well as the substantial soot layer beneath it. As a gelled system with a brief contact time, all of the "action" occurred at the surface of the soot/alkyd intermix layer, while the moisture was held back from the paint and the natural resin below. By controlling the pH in this preparation, the swelling and dissolution of the natural resin layer was limited, and it served, at least for the moment, as a stopping point so that the emulsion would not quickly reach the moisture-sensitive paint beneath.

Step 3: The 2:1 benzyl alcohol/acetone gel used in Step 1 was re-applied to remove the remaining earlier natural resin varnish. A very thin layer was brushed on the surface and immediately agitated and rinsed away with Shelsolv D-38 on cotton pads. Rinsing continued in this fashion until no visible residues remained. The results were immediate: removal of the final discolored resinous film exposed the original painted surface and revealed Sears' rich color palette and composition for the first time in decades (fig. 4).

Figure 4. After treatment detail. Steps 1 - 3 have been carried out, removing all of the alkyd resin, natural resin, and soiling material from the painted surface.

This treatment underscores the importance of thorough examination and analysis to characterize both original and non-original materials in a paint surface. It was only through this process that the complex layering sequence of emulsion paints, natural resins, overpaints, and alkyd resins intermixed with soot and soiling materials could be understood, and an appropriate cleaning system designed to "un-pack" the layers by targeting the particular properties of each for step-wise removal.

The emulsion-forming properties of Pemulen allowed us to carry out a cleaning by effectively emulsifying the residu es of intermixed polar/non-polar materials (swollen alkyd resin/soot) left on the surface of the discolored natural resin varnish. Had it not been for the extended dwell time required to swell the alkyd coupled with the water-sensitivity of the original paints, it might have been possible to use Pemulen TR-2 exclusively as a vehicle for bringing the benzyl alcohol/acetone to the surface to swell and remove the alkyd resins and soiling materials simultaneously. Nevertheless, it is important to note that the ability of Pemulen to emulsify solvents in an aqueous system is an important step in the advancement of less-toxic approaches to the cleaning of painted surfaces.