CLEANING PLASTICS IN MUSEUMS

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INTRODUCTION

Cleaning involves the removal of all materials that either change an object's materiality or meaning and have neither been applied intentionally by its creator nor are important as signs of its historical use (Bollard (2008)). Although all surveys of the condition of plastics conducted in museums in the United Kingdom and Scandinavia since the 1990s conclude that approximately 75% of collections require cleaning, few treatments have been developed (Shashoua and Ward (1995). This is mainly due to the high risk of damaging plastics mechanically or chemically when using an invasive cleaning treatment. Plastics which are in a rubbery phase at ambient temperature, such as polyethylene and plasticised polyvinylchloride (PVC), are visibly abraded by contact with brushes, cloths and sponges. Polyethylene containers including Tupperware®, are readily scratched by green scouring pads or nylon brushes during washing. Solvents and detergents applied either alone or as part of mixtures in commercial cleaning products can both extract additives from flexible plastics such as PVC and induce environmental stress cracking in rigid plastics such as polystyrene, polycarbonate and polymethylmethacrylate.

Despite the high risks, removal of oily fingerprints, carbonaceous dirt (external dirt) or crystalline, acidic degradation products (internal dirt) from museum objects or artworks comprising plastics is essential to maintain their significance, chemical stability and commercial value. This article summarises the findings of an exhaustive, 2-year evaluation of mechanical, aqueous and non-aqueous cleaning techniques for their effectiveness at removing external dirt and effect on chemical and physical stabilities of selected plastics. The research described was coordinated by the two authors as part of the EU 7th Framework Programme project POPART (Preservation of Plastic ARTefacts in museums) between 2008 and 2012. The project concluded with a conference 'Preservation Of Plastic ARTefacts in museum collections' held in Paris in 2012 and publication of the same name. The highlights of both conference and publication are available freely on the internet http://popart-highlights.mnhn.fr/

POPART was divided into four working groups each focusing on different topics such as plastics' identification, collection surveys, degradation and active conservation. Together with the Cultural Heritage Agency of the Netherlands, Victoria and Albert Museum in London and Paris-based Laboratories: Centre de recherche et de restauration des musées de and the Centre de recherche sur la conservation, the National Museum of Denmark evaluated mechanical, aqueous and non-aqueous cleaning techniques initially for their influence on the long term stability of plastics and afterwards for their effectiveness at removing dirt. The purpose was to assist conservators with making decisions concerning cleaning plastics.

This article will present an overview of the state of the art in cleaning plastics prior to the start of POPART, describe the research strategy and processes to evaluate mechanical, aqueous and solvent cleaning of selected plastics and conclude with the application of POPART's findings to two case histories.

STATE OF THE ART IN CLEANING PLASTICS

Until the launch of POPART in 2008, conservators believed generally that all semi-synthetic and degraded plastics were sensitive to water and solvents. This influenced the typical approach to cleaning them. Mechanical cleaning in the absence of aqueous cleaning agents or solvents was considered the technique offering the lowest risk of inducing permanent damage and, as a result, conservators chose to wipe away dust and loose particles with a dry cloth or brush to minimise damage. Where dirt was attached to the surfaces of an object as exemplified by oily fingerprints or sticky carbonaceous dirt and could not be removed with a dry brush or cloth, conservators often decided to leave it undisturbed to reduce the risk of inducing further damage.

Until 2008, all published research into plastic cleaning by conservators or conservation scientists had used visual appearance or optical microscopy alone for evaluating whether cleaning had caused damage to surfaces.

POPART CLEANING RESEARCH STRATEGY

The research strategy taken in POPART was to first ascertain whether the cleaning materials and techniques evaluated induced changes or degradation to model plastics substrates. Those that did not induce changes were further investigated for the effectivity of cleaning to remove artificial, standard dirt. Finally, the most effective and least damaging cleaning techniques were applied to real museum or study objects to compare the findings from cleaning model plastics with reality. Mechanical cleaning techniques were evaluated first and only the least damaging and most effective techniques were then combined with aqueous and solvent cleaning agents.

MODEL PLASTICS

New, colourless and transparent or pearlescent model plastics were used as model substrates to investigate whether cleaning would damage the plastics themselves. Initially, polymethylmethacrylate (PMMA), polyvinylchloride (PVC), unsaturated polyester (UP), high density polyethylene (HDPE), polystyrene both cast high impact (HIPS) and extruded (EPS) forms were selected as model plastics with each POPART partner researching one or two plastics for cleaning (see figure 1). Selection of plastics types for inclusion in POPART was based on their high representation in museum collections and requirements for cleaning. Unsaturated polyester was removed early from the project due to its inhomogeneity and replaced with cellulose acetate (CA). Extruded polystyrene proved too difficult to clean due to its uneven texture and was also discounted from POPART.

CLEANING MATERIALS, CLEANING AGENTS AND ARTIFICIAL DIRT

Published literature and verbal recommendations describing effective and non-damaging materials and techniques to clean plastics for industrial and conservation applications were used to select twenty-two cleaning materials, which were also available in all nine POPART partner countries. Materials comprised paper tissues, cotton swabs, natural and synthetic cloths, sponges and brushes and compressed air from can and pressure lines (see figure 2).

Published literature was also used to select aqueous- and solvent- based cleaning agents which complied with health and safety requirements in all partner countries. Aqueous cleaning agents included distilled water,

Figure 1. A selection of model plastics. From left to right; polymethylmethacrylate, plasticised PVC, unsaturated polyester (replaced with cellulose acetate), high density polyethylene, high impact polystyrene and expanded polystyrene (only included in the first stage). (photograph by Kathrine Segel).

Figur 1. Et udvalg af model plast. Fra venstre mod højre polymethylmethacrylat, blødgjort PVC, umættet polyester (skiftet ud med cellulos acetat), højdensitets polyethylen, slagfast polystyren og ekspanderet polystyren (kun med i starten af projektet) (foto af Kathrine Segel).

anionic and nonionic detergents, synthetic saliva and triammonium citrate.

THE AQUEOUS CLEANING AGENTS EVALUATED WERE:

- Dehypon LS45, 1% (w/w) in distilled water, non-ionic detergent, cloud point 22°C, fatty alcohol C12-C14, experimental critical micelle composition (CMC) 0.0598 g/l, supplied by Conservation Resources Ltd. (UK), www.conservationresources.com
- distilled water
- Judith Hofenk de Graaff detergent, 1% (w/w) of concentrate in distilled water, non-ionic detergent, concentrate comprises 50 g sodium dodecylbenzenesulphonate, 50 g tri-sodium citrate and 5 g sodium carboxymethylcellulose in 1000 ml distilled water
- Orvus WA Paste, 1% (w/w) in distilled water, anionic detergent, sodium lauryl sulphate. Orvus WA paste has an experimental CMC of 0.29 g/l, supplied by University Products. The Archival Company®, www.universityproducts.com
- Synthetic saliva, used as supplied, mucin (35mg per ml), unspecified quantities of xylitol, methylparaben, dinatrium, benzalkoniumchloride and EDTA, supplied by Pharmachemie BV (NL), www.tevapharmachemie.com
- Triammonium citrate (TAC), 2.5% (w/w) in distilled water, supplied by VWR & Bie & Berntsen, www.vwr.com

Figure 2. The 22 cleaning materials evaluated in POPART (photograph by Kathrine Segel).

Figur 2. Rensningsmaterialer (22 i alt) evalueret i POPART (foto af Kathrine Segel).

Solvents comprised ethanol, isopropanol, white spirit (mixture of paraffins, cycloparaffins and aromatic hydrocarbons with boiling ranges which typically lie between 150°C and 220°C) and xylene.

Two types of artificial dirt developed by cleaning researchers to mimic fingerprints or sebum soil and oily, carbonaceous soil which represented what is commonly known as museum dirt were prepared from published recipes and applied by brush or bar coater to model plastics. Sebum soil comprised palmitic acid and 1-propanol (Kuisma et al. (2005)). Organic oil soil was prepared by dispersing carbon black in paraffin oil (Koponen et al. (2007)). After application of artificial dirt, samples were allowed to dry for a week at room temperature in a covered box before cleaning was performed.

CLEANING PRACTICE

Initially, the effects of each mechanical cleaning procedure on clean model plastics were

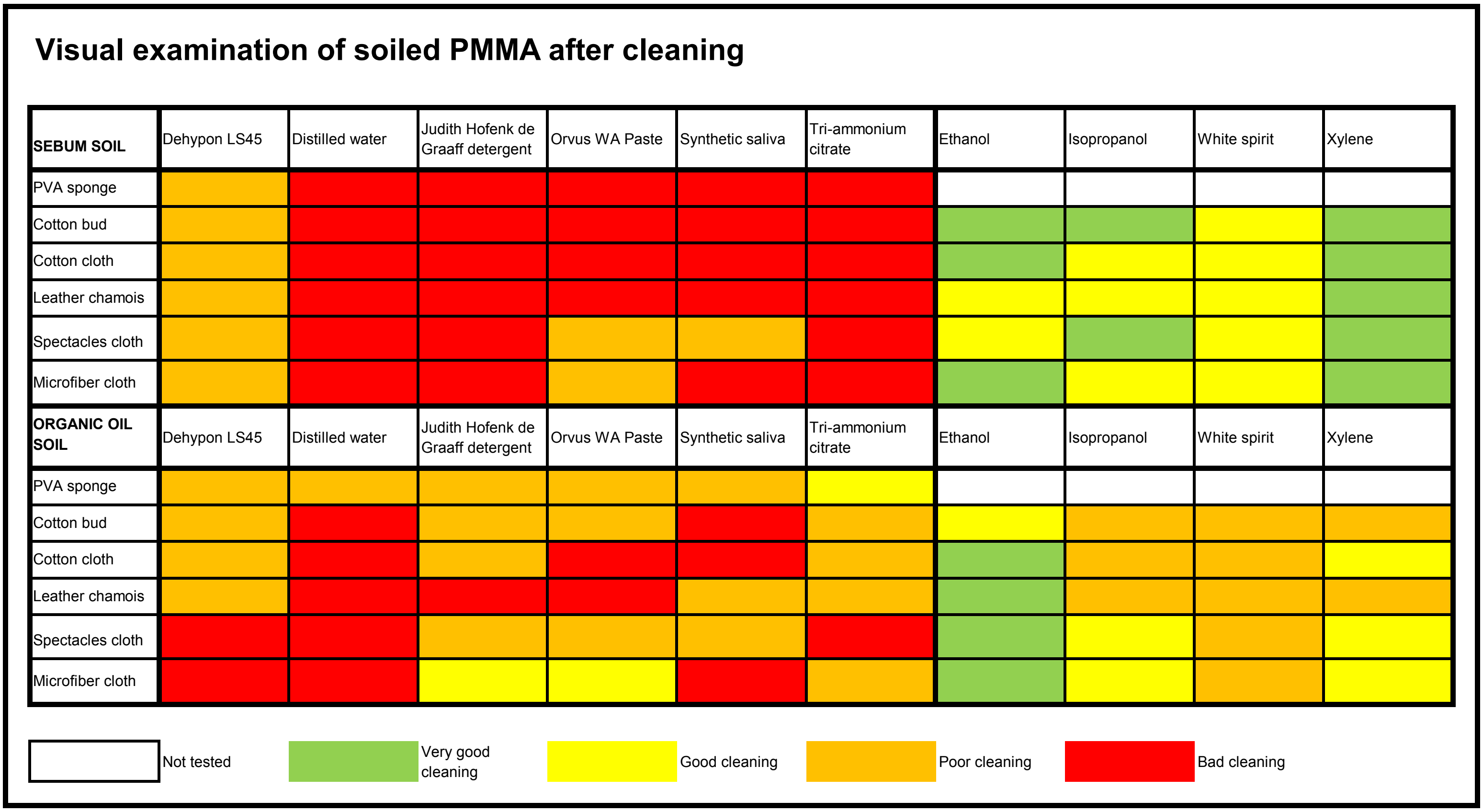

Figure 3. Visual evaluation of the effectiveness of cleaning soiled model PMMA. A traffic light colouring system has been used to represent 'very good cleaning' as green and 'bad cleaning' as red. Effectiveness is a measure both of cleaning techniques' abilities to remove dirt while not damaging the plastic substrate.

Figur 3. Visuel bedømmelse af effektiviteten ved rensning af snavset model PMMA. Farverne fra et lyssignal er blevet brugt til at repræsentere "meget god rensning" som grøn og "dårlig rensning" som rød. Effektiviteten er både et udtryk for rensningsteknikkernes evne til at fjerne snavs uden at beskadige plastmaterialet.

investigated. From literature and discussions with experienced conservators it was clear that mechanical action can be applied in either linear or circular directions and 5 repetitions of each were investigated separately. Twelve cleaning products which were found to abrade or otherwise change surfaces were removed from further participation in POPART. The remaining 10 cleaning materials were used to apply the aqueous and solvent-based cleaning agents. Finally, the six, least damaging aqueous, four solvent- based cleaning materials and six agents were tested on model plastics with artificial dirt. Selected samples were exposed to accelerated light and thermal ageing to investigate the chances of degradation induced by cleaning with time.

EVALUATION TECHNIQUES

Visual examination of surfaces before and after cleaning has long been the primary form of evaluation used by the conservation profession to determine whether changes have been induced by treatment producing such symptoms as scratches, deposited residues or reduced reflectivity. While visual examination is one of the most important techniques to evaluate a conservation treatment, it is highly subjective and, therefore, qualitative and poorly reproducible. In POPART, it was decided to supplement visual evaluation with quantitative changes in gloss, contact angle and percentage area scratched after each cleaning. Gloss is the ability of a surface to reflect specular light. Materials with smooth surfaces are highly reflective (glossy), while very rough surfaces reflect no specular light and therefore appear matt. Gloss of test substrates before and after cleaning was determined using a reflectometer.

Photomicrographs were examined for scratches by converting coloured images to black and white with a computer photo or paint program such as Adobe Photoshop and then by calculating the area occupied by scratches per unit area using the free program Image J (http://imagej.en.softonic.com/). Changes in surface energies of model plastics induced by cleaning were likely to be caused by contamination from residues of cleaning

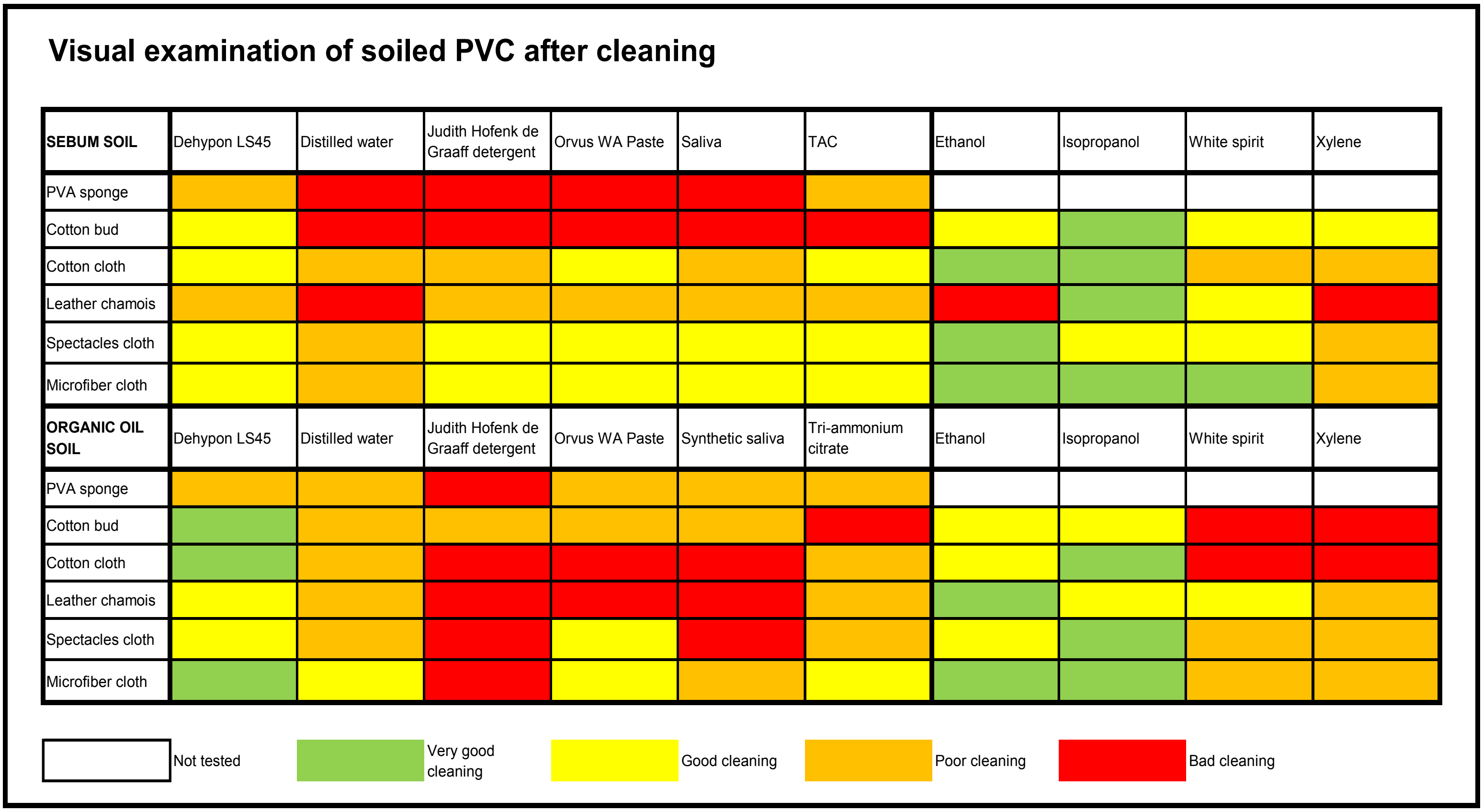

Figure 4. Visual evaluation of the effectiveness of cleaning soiled model PVC. A traffic light colouring system has been used to represent 'very good cleaning' as green and 'bad cleaning' as red. Effectiveness is a measure both of cleaning techniques' abilities to remove dirt while not damaging the plastic substrate.

Figur 4. Visuel bedømmelse af effektiviteten ved rensning af snavset model PVC. Farverne fra et lyssignal er blevet brugt til at repræsentere "meget god rensning" som grøn og "dårlig rensning" som rød. Effektiviteten er både et udtryk for rensningsteknikkernes evne til at fjerne snavs uden at beskadige plastmaterialet.

agents or surface inhomogeneity caused by scratches. They were quantified by determining changes in contact angle formed between a 20 microliter drop of distilled water and surfaces of model plastics.

Because changes in gloss, contact angle and percentage of scratches before and after cleaning were each independently related to surface properties of the plastic being cleaned, they could be mathematically combined to calculate a Cleaning Vector, M where M = √ ((% area scratched)^2 + (%change in contact angle)^2 + (%change in gloss)^2 for each cleaning material/agent combination. Cleaning was a measure of both how effective and how damaging cleaning processes were. There was an attempt to incorporate visual assessments into Cleaning Vectors but the result was unsatisfactory. However, the trends exhibited by Cleaning Vectors were mirrored by visual assessment.

POPART RESULTS FOR CLEANING MODEL PMMA AND PLASTICIZED PVC

Although mechanical cleaning has been generally perceived as the least damaging technique to remove dirt from plastics, POPART results suggest that the risk of inducing scratches or residue deposits using a dry brush or cloth is measurable. It is less damaging to remove loose dust particles by blowing clean filtered air from a can or a pressure line, although the latter can be contaminated with lubricant oil. For PMMA and PVC the five following materials were found to be least damaging to surfaces; cotton bud, cotton -, microfiber - and spectacles cloths, natural (ostrich) and synthetic feather dusters. Feather dusters cannot be used in combination with aqueous cleaning products or solvent. It was concluded that linear rubs removed dirt from surfaces, while circular rubs merely redistributed it.

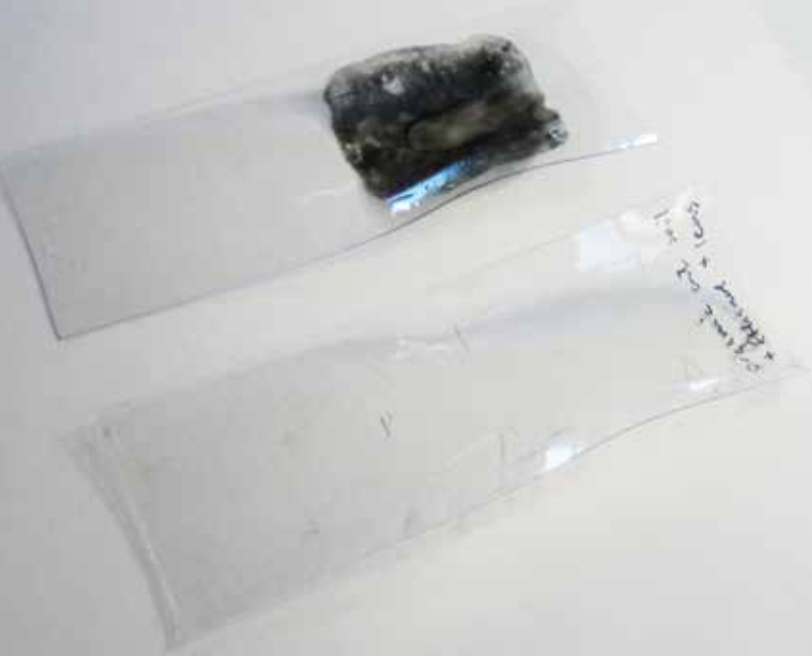

Figure 5. Plasticised PVC model plastics deformed one week after applying organic oil soil (upper). The deformation persisted despite cleaning (lower) (photograph by Kathrine Segel).

Figur 5. Blødgjort PVC model plast blev deformeret en uge efter organisk olieholdig snavs var påført (øverst). Deformationen vedblev efter rensning (nederst) (foto af Kathrine Segel).

The concentration of scratches was severely reduced when combining cotton bud or any of the cloths with liquids in the form of water, aqueous detergent solutions and solvent. On clean model plastics the aqueous cleaning agents 1% anionic detergent Orvus WA Past, 1% non-ionic detergent Dehypon LS45, saliva and 2.5% triammonium citrate minimised scratching and the opportunity for residues to form. However, when cleaning dirty model plastics, aqueous cleaning agents failed to dissolve artificial dirt, particularly that representing finger prints (see figures 3 and 4). Instead of cleaning dirty plastics, aqueous cleaning caused further damage, because any undissolved particles were moved across surfaces causing abrasion. This means that identifying dirt types is of great importance when selecting cleaning agents.

Visual examination suggested that both artificial dirts had started to migrate into the plasticised PVC within a week after application, causing deformation of the material (see figure 5). A month after cleaning had been performed the sebum soil was no longer visible whereas the organic oil soil appeared more particulate – indicating that the paraffin oil had migrated into the PVC. Deformation of the material was also evident. It is likely that the plasticiser in PVC had dissolved the organic components of the artificial soils and transported them between the polymer chains and away from surfaces. The POPART results emphasize the importance of cleaning plastics especially PVC, immediately after soiling takes place.

CLEANING PMMA – A CASE STUDY

In order to examine how cleaning research on model, new PMMA related to real museum objects, Light Sculpture without Light, made in 1976 by the Danish artist Gunnar Aagaard Andersen was selected as a study object. The sculpture, which belongs to the National Gallery of Denmark, comprises several white acrylic sheets, each ca. 5mm thick. These have been

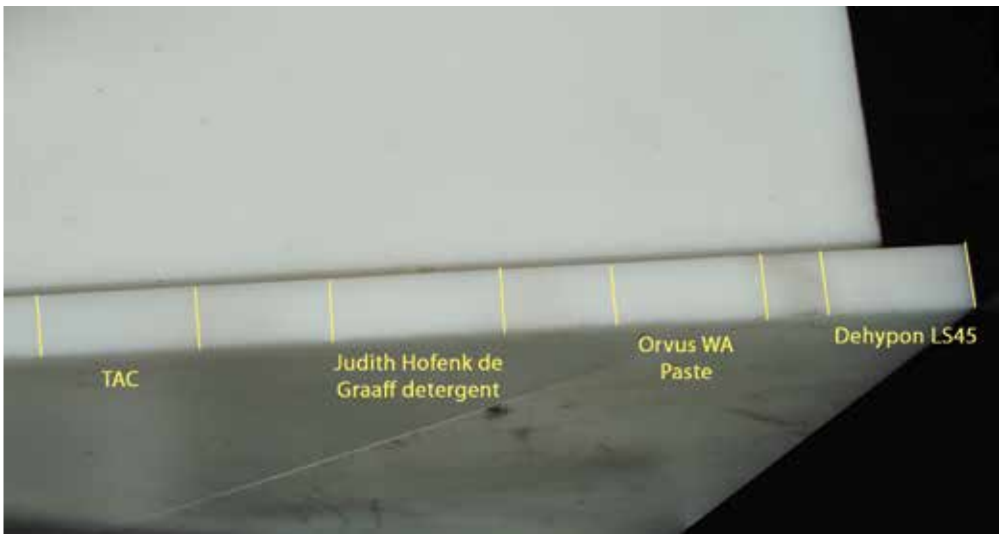

Figure 6. Cleaning tests were performed on the edges of Gunnar Aagaard Andersen's polymethylmethacrylate sculpture Light Sculpture without Light (1976) using triammonium citrate (TAC), Judith Hofenk de Graaff detergent, Orvus WA Paste and Dehypon LS45 (photograph by Kathrine Segel).

Figur 6. Der blev udført renseprøver med triammoniumcitrat (TAC), Judith Hofenk de Graaff detergent, Orvus WA Pasta og Dehypon LS45 på kanten af Gunnar Aagaard Andersens skulptur Lysskulptur uden lys (1976) (foto af Kathrine Segel).

adhered to form a series of concentric, open boxes. When placed in front of a natural light source, as originally intended by the artist, the transparency of the acrylic sheets admits the light and thus reveals the internal spaces of the object.

The sculpture was chosen as a study object for two reasons. It consisted of colourless acrylic sheets and was evenly covered with a layer of dark oily soil and several fingerprints could be observed in raking light. In addition the lower part of the sculpture was severely scratched. Most scratches were filled with soil which darkened the object. Light Sculpture without Light represented both the model plastic and the artificial soils tested in POPART. Unfortunately the sculpture cannot be viewed as originally intended, because some of the joints have failed.

Figure 7. Migrating plasticiser from Crash Test Dummy Sierra Sammy's head is sticky and traps dirt from the surrounding environment (photograph by Yvonne Shashoua).

Figur 7. Snavs fra omgivelserne sidder fast i klæbrig migrerende blødgører fra Crash Test Dummy Sierra Sammys hoved (foto af Yvonne Shashoua).

Cleaning research into model PMMA suggested that solvents had performed slightly better than aqueous cleaning agents at removing both sebum and organic oil soils. However because the artwork was more than 30 years old and the plastic was visibly, physically damaged and therefore more vulnerable to stress cracking when in contact with solvents, caution was required. A selection of aqueous cleaning agents was tested along the lower edge of the sculpture (see figure 6). Although it was difficult to see a difference in effectiveness with the naked eye, under magnification it was clear that Orvus WA Paste and triammonium citrate were both the most effective at removing dirt and least damaging for new, model PMMA.

It was decided to clean the sculpture with Orvus WA Paste 1% applied by microfiber cloth. This technique was successful in removing both the even soil layer and fingerprints but not soil trapped inside scratches. In these recessed areas a small cotton bud was found to be the most effective tool but cleaning had to be performed in the same direction as the scratch. Most of the soil was removed this way. Although the researchers were aware of the risk of environmental stress cracking when using solvents in contact with plastics, trapped soil was successfully removed with ethanol using a microscope to help focus on scratched areas and to detect any microscopic damage including spreading of cracks. The sculpture was rinsed with distilled water applied by microfiber cloth after cleaning and no damage was detected.

CLEANING PVC – A CASE STUDY

A crash test dummy, Sierra Sammy, belonging to the Science Museum in London was selected as our second case study. The dummy was made in the mid 1970s and acquired by the museum in 1979. Crash test dummies were used to model the motion of a human driver or passenger when applying the brakes of a vehicle and to predict any injuries arising from not wearing a seat belt. The object comprised a mechanical, steel structure to replicate the weight (60kg in this case) and movement of a human being and was covered with plasticized PVC skin to add textural and cosmetic properties.

In contrast to Gunnar Aagaaard Andersen's sculpture where the soil layer was clearly only superficial, the PVC study illustrated different challenges. After 10 years in a well-sealed showcase, the phthalate plasticiser included in PVC's formulation, had migrated to surfaces, leaving it shiny, discoloured and sticky. The plasticiser could be considered an internal degradation product. Fifteen years later, phthalate plasticiser started dripping from the PVC covering the object's head, hips and feet (see figure 7). The high concentration of phthalate vapour within the sealed showcase caused the vapour to condense and drip. Dust adhered to the sticky surfaces, thereby altering the object's appearance. Fourier Transform Infrared spectroscopy revealed that the dummy's soil layer comprised phthalate, carbon particles and red pigment which had been used to represent blood in the dummy's construction.

POPART research had shown that PVC was cleaned more effectively by solvents than by aqueous cleaning products. However, because removal of internal forms of dirt, such as plasticisers, had not been investigated in POPART, additional information was required to develop a suitable cleaning strategy. Phthalate plasticizers are esters and their carbonyl (C=O) groups induce polarity but they cannot hydrogen bond with other materials readily. As a result they are partially soluble in water but more soluble when detergents or solvents are present. Because the crash test dummy was too large to be placed easily in a fume cupboard, solvent cleaning was not an optimal solution from a health and safety perspective and therefore aqueous cleaning was preferred.

Initial cleaning trials using microfiber cloths and aqueous cleaning products were conducted by the authors. Afterwards, Science Museum conservation staff, none of whom had participated in POPART were instructed in how to perform the actual cleaning in order to examine whether conservators could apply POPART results to their own collections.

Oily dirt and plasticizer could be removed using both non-ionic detergent Dehypon LS45 and anionic Orvus WA Paste applied by polyester microfiber cloth followed by a rinse in distilled water. Detergent was applied by cotton bud in recessed areas which were harder to access using a light microscope to focus the treatment. After cleaning, the dummy appeared paler in colour due to the removal of black dirt on its surfaces. The PVC skin had neither measurably shrunk nor embrittled despite the removal of some plasticiser. The dummy was then returned to display. Examination of the object 18 months after cleaning, suggested that phthalate plasticiser has begun to migrate to the object's surfaces once again which indicates that the treatment will require repeating and perhaps reviewing.

CONCLUSION

Research into conservation cleaning of plastics is an area which had not been extensively researched prior to POPART's launch in 2008. Some of the major findings have been counterintuitive and are likely to change conservation cleaning practice for plastic design objects and artworks. For example, mechanical cleaning using a dry brush, cloth or sponge, has long been perceived as the least damaging technique to remove dirt. However it is ineffective for oily or biological dirt such as fingerprints and induces scratches on both thermoplastic and thermosetting materials. Adding sufficient lubricant in the form of water, detergent solution or solvent to the mechanical cleaning material was more effective at removing dirt and less damaging to the plastic substrate.

Of the 22 cleaning products evaluated, only canned air, natural and synthetic feather dusters left all plastics unchanged. Duzzit sponges, Scotch Brite sponges and all paper-based products induced more scratching than brushes and cloths. Akapad yellow and white sponges, compressed air, latex and synthetic sponges and goat hair brushes deposited residues. Based on Cleaning Vectors, distilled water, Orvus WA Paste, Judith Hofenk de Graaff and Dehypon LS45 were the least damaging cleaning agents for polymethyl methacrylate, plasticised PVC, high density polyethylene, high impact polystyrene and cellulose acetate. Organic solvents were effective at removing both types of artificial dirt from model plastics but the increased risk of removing plasticisers or inducing stress crazing counted against their use where aqueous alternatives were possible.

Transferring the results obtained by cleaning model plastics to real or study objects required some adaptations. Dirt on real objects was rarely homogeneous or from one source as evaluated in POPART experiments, but could include internal dirt such as migrated plasticiser from PVC and its associated degradation products. Plastics themselves were often degraded and discoloured. With time, dirt had migrated further into the body of the plastic. Despite the additional challenges, the general findings for poor and effective cleaning materials and agents on the model plastics and artificial dirt evaluated in POPART were also true for real objects. It is clear that the flow charts designed to guide conservators when cleaning plastics offer useful starting points and may be found freely on http://popart-highlights.mnhn.fr/

ACKNOWLEDGEMENTS

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SUMMARY

Although all surveys of the condition of plastics conducted in museums in the United Kingdom and Scandinavia since the 1990s conclude that approximately 75% of collections require cleaning, few treatments have been developed mainly due to the high risk of damaging plastics mechanically or chemically using an invasive cleaning treatment. Despite the high risks, removal of oily fingerprints, carbonaceous dirt (external dirt) or crystalline, acidic degradation products (internal dirt) from museum objects or artworks comprising plastics is essential to maintain their significance, chemical stability and commercial value. This article presents the results of structured research into cleaning polymethylmethacrylate (PMMA) and plasticised polyvinylchloride (PVC) which comprised part of the collaborative EU 7th Framework project POPART (Preservation Of Plastics ARTefacts in museums) between 2008 and 2012. An exhaustive study of the risks associated with mechanical, aqueous and solvent-based cleaning of both new, model plastics and real objects is presented. A PMMA sculpture from 1976 by Danish artist Gunnar Aagaard Andersen and a Crash Test Dummy in plasticised PVC from the mid 1970s are selected as study objects and successfully cleaned using the guidelines developed for model plastics and artificial dirt.

KEY WORDS

POPART, plastics, polymethylmethacrylate, polyvinylchloride, mechanical cleaning, aqueous cleaning, solvent cleaning

YHTEENVETO

Iso-Britannian ja Skandinavian museoissa tehdyt muovisten museoesineiden ja taideteosten kuntokartoitukset osoittavat, että arviolta 75 % kokoelmista on puhdistusta vailla. Puhdistusmenetelmiä on kehitetty vain vähän, koska voimakas mekaaninen tai kemiallinen puhdistus voi aiheuttaa vaurioita. Muoviesineiden merkityksen, kemiallisen vakauden ja kaupallisen arvon säilyttämiseksi on riskeistä huolimatta kuitenkin välttämätöntä poistaa rasvaiset sormenjäljet, hiilipitoinen lika (ulkoinen lika) ja happamat hajoamistuotteet (sisäinen lika). Tämä artikkeli kertoo järjestelmällisestä tutkimuksesta, jossa puhdistettiin polymetyylimetakrylaattia (PMMA) ja plastisoitua polyvinyylikloridia (PVC). Tutkimus oli osa EU:n seitsemättä Framework-yhteistyöprojektia, POPARTia, joka toteutettiin vuosina 2008-2012. Artikkelissa esitellään tutkimustulokset kaikista mekaanisen puhdistuksen ja vesi- ja liuotinpuhdistuksen riskeistä. Tutkimuksessa puhdistettiin sekä uusia muovisia mallikappaleita että varsinaisia esineitä. Mallikappalemuovin ja keinotekoisen lian avulla kehitettiin puhdistussuositukset, joiden mukaisesti puhdistettiin Gunnar Aagaard Anderssenin PMMA-veistos vuodelta 1976 ja plastisoidusta PVC:stä valmistettu kolarinukke 1970-luvun puolivälistä.

AVAINSANAT

POPART, muovit, polymetyylimetakrylaatti, polyvinyylikloridi, mekaaninen puhdistus, vesipuhdistus, liuotinpuhdistus

RESUMÉ

Selv om alle undersøgelser af plastmaterialers bevaringstilstand udført på museer i Storbritannien og Skandinavien siden 1990'erne konkluderer, at cirka 75% af samlingerne kræver rensning, er der kun blevet udviklet ganske få behandlingsmetoder, hvilket bl.a. skyldes risikoen for at beskadige plastmaterialet mekanisk eller kemisk som følge af en invasiv rensningprocedure. På trods af disse risici er det altafgørende at kunstværker og museumsgenstande renses for fedtede fingeraftryk, kulstofholdig snavs (ydre snavs) eller sure og krystallinske nedbrydningsprodukter (indre snavs), hvis genstandenes betydning, kemiske stabilitet og kommercielle værdi skal bibeholdes. Denne artikel præsenterer resultaterne af en systematiseret forskning indenfor rensning af polymethylmethacrylat (PMMA) og blødgjort polyvinylchlorid (PVC), som mellem 2008 og 2012 udgjorde en del af det europæiske 7th Framework samarbejdsprojekt POPART (Preservation Of Plastics ARTefacts in museums). En udtømmende undersøgelse af de risici, der er forbundet med mekanisk, vand- og solventbaseret rensning af henholdsvis ny model plast og rigtige genstande præsenteres. En PMMA skulptur fra 1976 af den danske kunstner Gunnar Aagaard Andersen og en Crash Test Dummy i blødgjort PVC fra midten af 1970'erne blev udvalgt som test objekter, og begge genstande blev renset med tilfredsstillende resultater ved at følge de udviklede retningslinjer for model plast og kunstig snavs.

NØGLEORD

POPART, plast, polymethylmethacrylat, polyvinylchlorid, mekanisk rensning, vandbaseret rensning, solventbaseret rensning

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