INTERNATIONAL SYMPOSIUM
CONTEMPORARY ART: WHO CARES?
Research and Practices in Contemporary Art Conservation

CONTEMPORARY CONSERVATION

Dry cleaning plastic surfaces

The National Museum of Denmark
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INTRODUCTION MODERN AND CONTEMPORARY ART ARE CHARACTERISED BY THE DIVERSITY OF MATERIALS PRESENT. WHILE PLASTICS WERE ONCE THOUGHT TO BE THE WONDER PRODUCT OF THE 20TH CENTURY, MUSEUM PROFESSIONALS ARE NOW CHALLENGED BY CONSERVING PLASTICS FOR THE FUTURE.

CONSERVATORS AND SCIENTISTS AT THE NATIONAL MUSEUM OF DENMARK ARE RESEARCHING THE RISKS ASSOCIATED WITH MECHANICAL DRY CLEANING OF FLEXIBLE AND RIGID PLASTICS. THIS INITIAL STUDY IS PART OF THE EUROPEAN 7TH FRAMEWORK RESEARCH PROJECT POPART (Preservation of Plastic ARTefacts in museums). SUBSEQUENT CLEANING TESTS WILL INVOLVE AQUEOUS AND NON-AQUEOUS-BASED CLEANING AGENTS IN COLLABORATION WITH ICN, V&A MUSEUM, AND C2RMF.

CAN DAMAGE BE QUANTIFIED? Conservators of modern and contemporary art are constantly challenged by the variety of materials used by artists. One such challenge is cleaning plastics' vulnerable surfaces. While there have been detailed studies into the cleaning of acrylic paint, no previous structured research has focused on surface cleaning of three dimensional plastics.

The present study is divided into several stages. While the final goal is to clean real objects, initial testing is carried out on clean model plastics. The effect of dry or mechanical cleaning techniques is under investigation. Cleaning is performed with various tools applied to plastics using two different application procedures. The tools which prove least damaging to model plastics will be combined with both aqueous and solvent based cleaning agents. The combinations which prove least damaging to model plastics will be evaluated for their effectiveness at removing soils and long term effects on plastics studied.

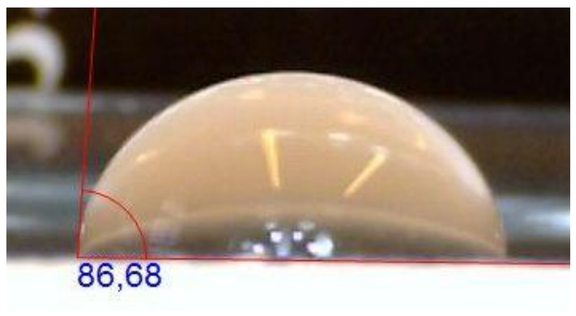
Based on a literature survey, 25 mechanical tools for cleaning were selected (see photo on the left). They included brushes, dusters, cloths, and sponges. The purpose of the initial stage was to investigate their potential to damage plastics. The mechanical dry cleaning tests were carried out on six different plastics: polymethylmethacrylate, polyvinylchloride, high density polyethylene, unsaturated polyester, high impact polystyrene and polystyrene foam.

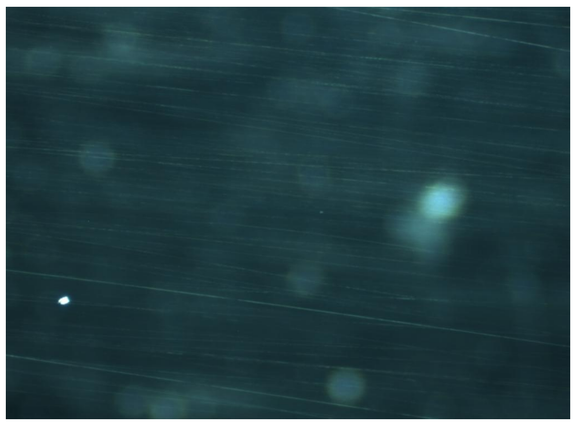
A strategy was developed to describe and quantify changes on plastic surfaces. A visual examination of the surfaces was made before and after cleaning. This examination revealed whether the selected tool had caused immediate damage. Not all changes were visible to the naked eye. Micro abrasion and some forms of contamination were invisible.

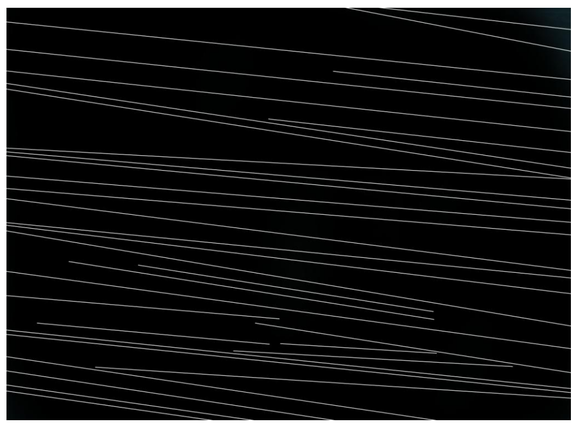
Change in gloss has been used by the paint industry to document damage. Measurements were taken at 20º and 60º. Because the model plastics were largely transparent and colourless, internal reflection of the incident light interfered with reflection from surfaces. However, for most of the model plastics investigated, gloss was measurably reduced by cleaning.

Another technique used was to study change in surface energy induced by cleaning. This was done by measuring change in contact angle formed between a drop of distilled water and the plastic surface (see photo on the left). A simple, low-cost USB microscope providing 400 times magnification and the supplied software were sufficient to reliably determine the contact angle. The changes in contact angle were small, but are likely to increase when aqueous and solvent based cleaning agents as well as soil are introduced in the next stage.

A simple technique to quantify any damage caused by mechanical cleaning tools was developed. Though invisible to the naked eye, photomicrographs of cleaned surfaces at magnifications between 30 and 400 often revealed scratches. It was decided that documenting the number of scratches alone was insufficient because it ignored their dimensions. Instead the percentage area scratched was calculated. Using Adobe Photoshop photomicrographs were falsely coloured to emphasize scratches (see photo on the left). Afterwards the free computer software Image-J was used to calculate the percentage area scratched by counting black and white pixels on the manipulated image. This method proved extremely useful in studying the effects of mechanical cleaning.







CONCLUSION Mechanical dry cleaning tests on model plastics have shown that some tools frequently used by conservators to clean other materials safely, damage plastics. Though invisible to the naked eye these changes can be observed under the microscope. In addition to visual examination, change in gloss, and contact angle measurements, a simple technique to quantify damage caused by mechanical cleaning was developed. Photomicrographs of surfaces were manipulated using readily available software. This quantified the extent to which surfaces were mechanically damaged.

Evaluation of all plastics before and after cleaning suggested that the ten least damaging mechanical cleaning tools were compressed air, cotton bud, cotton cloth, leather chamois, microfiber cloth, ostrich feather duster, rubber cleaning sponge, sable hair brush, spectacles cloth and synthetic feather duster. These ten materials will be used to apply aqueous and solvent cleaning agents to model plastics in the next phase of the project. It is expected that results of the mechanical cleaning tests will be presented at ICOM-CC Triennial Conference in Lisbon 2011.

NATIONALMUSEET
POPART Preservation Of Plastic ARTefacts in museum collections
Education and Culture DG
Culture Programme
Mondriaan Stichting (Mondriaan Foundation)