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Conservator's Aspects of the Project "Men and Books"

1 Introduction

Any research project in conservation aims at preservation of the cultural heritage. We are only able to understand it better ourselves and convey all of its artistic, aesthetic, material and historical aspects into future to enable future generations to understand their past and present from these first-hand witnesses, if we are capable, first and foremost, to preserve it in the best way possible.

The project "Men and Books: Risk-Free Use of the European Written Cultural Heritage"[1] formulates and attempts answering a number of pressing questions, which are highly relevant in a conservator´s everyday professional life.

The main focus of the project concerns the advantages of ethylene oxide fumigation of library materials – a practice that has long been used in conservation – and its potential risks for readers, if any. However, the project goes beyond that specific question and looks at some other practical issues in conservation and discusses the approach to book conservation in more general terms.

2 Microorganisms

BOKU (VIBT-Department of Biotechnology, University of Natural Resources and Life Sciences, Vienna), a project partner institution, was responsible for conducting a survey that focused on detection of microorganisms in books, understanding their vitality parameters and judging whether or not the microorganisms were actually killed by ethyl-

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ene oxide ("EtO"). The methods of the survey are described elsewhere (see contribution by Katja Serflinger "Mould 'Men and Books' – Microbiological aspects of use and restoration") and its key findings were formulated as follows: "From these results we conclude that the fungal flora in the Swidnica volumes was successfully killed by the ethylene oxide treatment. Today, spores from airborne fungi are predominant on the books. Since no residues of the ethylene oxide could be detected, the books are now susceptible to new infections. Therefore, climatic optimization of the storage conditions is highly recommended."[2]

3 Ethylene Oxide

The EtO detection was performed by the project partner European Research Centre for Book and Paper Conservation-Restoration, Horn ("ERC"). The method is described elsewhere (see contribution Ethylene-oxide for book fumigation by Patricia Engel in "Men and Books – from Microorganism to Megaorganism"). The analyses showed that no EtO was detectable with either gas chromatography or FID detection techniques.

However, as the documentation on fumigations treatments performed in the past didn't provide sufficient information, an additional series of tests was performed.

The main focus of the new test had been to involve more material, as to possibly find EtO residues. Tree books all together representing a volume of 20 × 30 × 10 cm was fumigated in controlled setup.
Books were fumigated under the following conditions:

"*Report of disinfection* no. 483
No. of the bottle with gas: 5555
No. of the program: 1
Start: date 17/2/2014
Hour 7:06

2 Katja Sterflinger, Patricia Engel Poster for IIC Concerence – Dissemination action of the Project

Annealing / moisturizing
Duration time: 4.0 h
Humidity:
Task: 45, start: 15, end: 32

Disinfection
Duration time: 24.1 h
Set time: 24.0 h

Rinsing
No. of cycles: 17
Task: 17
Gas release: 17/2 /2014 12:06
Pressure before: 100 mBar
Pressure after: 501 mBar

Completion of the process: 18/2/2014 7:14

interruption of the process: No
Catalyst: Yes
Remaining time of the pump operation: 55 h
Remaining time of the filter operation: 500 h

The End

Signature ……."
(report sent by Dr. Aderhold, translated by M. Swieton)

From this report it remains unclear what gas was used and what temperature was held. It furthermore should be explained what program 1 means and there is no explanation for the humidity. As it cannot be expected that more detailed information is given, there

Gas chromatography analysis showed that no EtO could be detected.

All the estimates of health hazards associated with the residual EtO were based on measurements of EtO offgassing. If no gas is detected,

we have no information on the hazard of the method for the reader, archivist and conservator.

The survey of the dummy material was done by the ERC (collagen material) and the project partner Technical University Graz (TUG) (cellulose material)

The collagen material was surveyed using the methods developed by Larsen et al.[3]

Whatman I filter paper, Wildbret parchment and leather by Forschungsinstitut für Leder und Kunststoffbahnen were used for preparing dummies (pieces of untreated material). The leather was tanned with sumach. The treatment procedure was as follows:

- Specimen 1 was immediately fumigated with EtO after it was produced;
- Specimen 2 was infested with microorganisms;
- Specimen 3 was infested with microorganisms and fumigated with EtO;
- Specimen 4 was the reference specimen and remained untreated;
- Specimen 5 was aged artificially at the TUG (according to to ÖNORM A 1116)
- Specimen 6 was aged artificially and subsequently fumigated with EtO;
- Specimen 7 was artificially aged and then artificially infested with microorganisms, and
- Specimen 8 was aged, infested with microorganisms and fumigated with EtO.

Specimens 2, 3, 7 and 8 (leather and parchment) were found to decay completely. The reason for this was that, in addition to the artificial ageing, the material was heated when it was artificially infested with microorganisms. Heat and humidity destroyed the material before the EtO fumigation.

Specimens 5 and 6 were found to become darker than they were before the treatment, which was due to the artificial ageing. There was,

3 Larsen et al. (1996, 2002)

however, no visible difference between the specimens which were aged artificially first and then infested with microorganisms and incubated and those which were only infested with microorganisms and incubated. Incubation did much more harm to the material than the artificial ageing, where humidity and temperature were controlled.

Specimens 1 and 4 looked fine. The fact that specimen 4 was in good condition is not surprising, but it is noteworthy that the leather and parchment specimens which were only fumigated with EtO also looked good.

A visual observation was followed by a fibre length analysis.

Number	Length of fibres and distribution of fibre lenght
1	Wider fibre length dissemination
2	Very short
3	Very short
4	long intact fibres
5	strongly accumulated but still long fibres
6	accumulated but medium long
7	Extremely short
8	Extremely short

Tab. 1 Fibre length of parchment and leather before and after treatment

This result shows, that artificial infestation, which was combined with additional impact of heat and humidity damaged the material severely. That artificial aging lead to a shortage of fibres was to be expected. However the examination also showed that EtO fumigation damaged the material.

Finally, shrinkage intervals[4] were measured. The heating rate was 2 °C per minute. The FP 82 Hot Stage by Mettler Toledo and FP 90 centr. processor and a Zeiss AxioCam IC were used.

4 Larsen et al. (1993a, 1993b, 1996)

	Start temp in °C	A1	B1	C	B2	A2
Pe1	24.0	33.9	39.2	40.9	58.4	64.3
Pe4	25.0	35.1	47.2	50.0	59.1	67.0
Pe5	25.0	54.0	40.3	50.0	58.5	64.0
Pe6	26.0	34.0	40.0	42.3	55.2	56.0
Le1	25.0	38.0	61.7	63.7	77.7	82.8
Le4	27.9	52.2	65.3	74.0	79.1	85.9
Le5	28.0	48.7	52.0	57.0	65.9	68.0
Le6	28.0	40.3	49.0	55.3	60.0	60.0

Tab. 2 Shrinkage intervals of parchment and leather samples before and after treatment

The shrinkage temperature measurements confirmed the results by the observation of fibres.

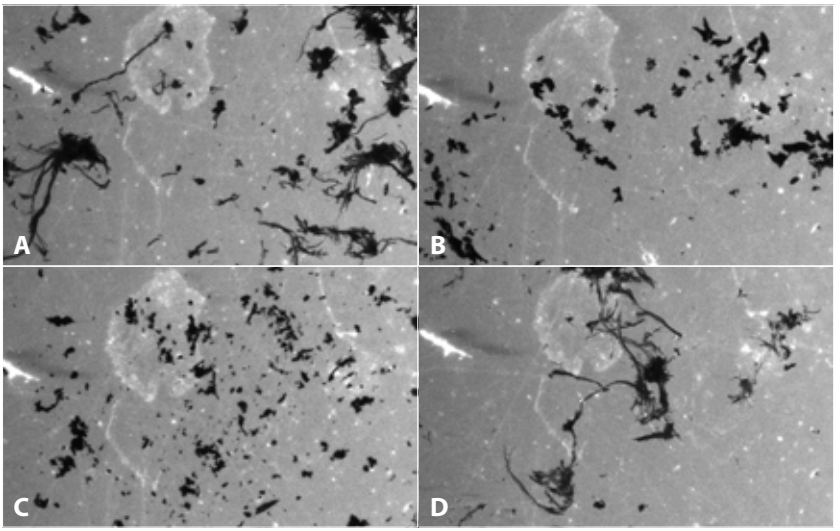

Fig. 1 A) Wider fibre dissemination Le 1 the EtO fumigated; B) Very short fibres Le 2 infested with microorg.; C) Very short fibres Le 3 infested with microorg. and EtO fumigated; D) Long intact fibres of Le 4 the reference dry – all samples 20×

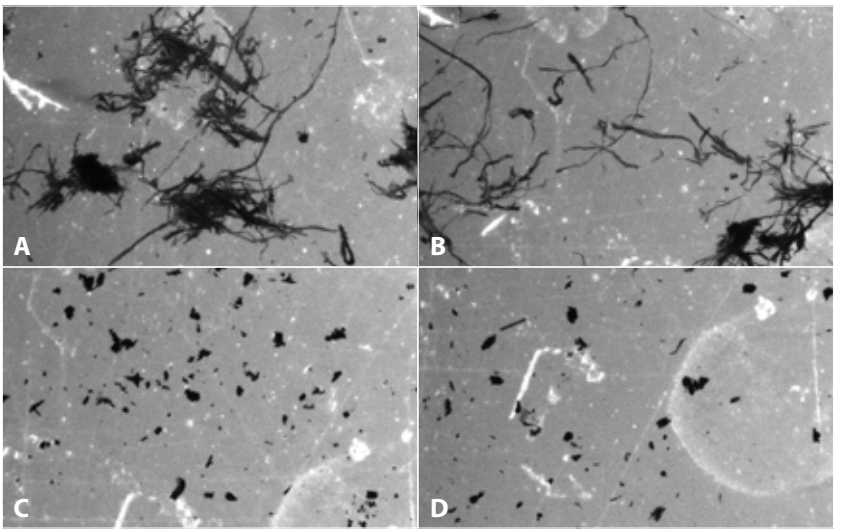

Fig. 2 A) Strongly accumulated but still long fibres Le 5 aged leather; B) Accumulated but medium long Le 6 aged and EtO fumigated; C) Extremely short fibres Le 7 aged and with microorg. infested; D) extremely short fibres Le 8 aged and with microorg. infested and EtO fumigated – all samples 20×

The results represent an average calculated out of 20 measurements. Fig. 1B, Fig. 1C, Fig. 2C and Fig. 2D could not be used for shrinkage temperature measurement, as they were already shrunk.

The aged and EtO fumigated material (Fig. 2B) shows better results than the only fumigated material (Fig. 1A) in C area, however the shrinkage starts earlier in Fig. 1A.

Comparing Fig. 2A and Fig. 2B it becomes clear, that EtO fumigation damaged the fibres more than artificial aging only.

4 Recommendations for Techniques of Treatment Alternative to EtO Fumigation

Any suggestions for efficient methods of treatment alternative to EtO fumigation would be of particular interest to conservators working directly on the heritage. Some suggestions did come up in the course of the project, but the related tests could not be conclusively finished during the project term.

5 Potential Recommendations for Conservators

The project was also intended to serve as an invitation for conservators who share the same general ethical and philosophical principles but may be working in different macro-cultural environments, to join an international discussion facilitating a Europe-wide dialogue on the issue. It started with a public announcement, with the following text distributed as a baseline text.

5.1 Introduction to the Announcement

The Archive of the Holy Trinity of Świdnica, Poland, houses manuscripts and printed books as well as unbound bundles of archival material. They are made of paper of all sort, leather and parchment.

The following text is intended as a basis for conservation-restoration treatment of selected individual items, which is expected to be undertaken in the context of Men and Books EU project. However, the following description is meant by the project partners to serve some wider objectives as well, operating as a sort of guidelines that can be applied by conservators working in any other archive housing similar material in the whole of Europe.

The paper doesn't touch on other preservation measures, such as proper storage, housing, boxing, climate control etc., as they go beyond the terms of reference of the projects' work package.

The ideas presented below are based on the conservation principles suggested by Cesare Brandi and the minimal intervention approach. Minimal intervention involves "doing as little as possible, but as much as is needed." The concrete measure must be decided for each and every book individually and can never be described exhaustively and in full detail. Making sure that conservators make the most appropriate decisions as to the use of particular conservation measures and materials and, much more importantly, the way in which the conservation treatment is executed, is the main focus of academic training of conservator-restorers. As any material carries information that may be obscured or lost by application of some conservation measures, a prop-

erly trained conservator-restorer must take the utmost care to preserve as much of the material as absolutely possible.

Conservation measures taken should also take into account the future use of the material to the degree it can be foreseen from the recent perspective and experience.

5.2 Possible Damage and its Treatment

Book Covers

Book covers are made to protect the book blocks, however, this original function of the cover need not be preserved in any case. If the book is handled carefully, we can even restrict our activity to giving instructions for proper handling.

What should be done, however, is refixing those elements of the cover which might be lost without such intervention.

One serious problem is the decay of leather tanned with vegetable material. We would like to invite suggestions for dealing with this particular problem from conservators, as we could not recommend any proper treatment so far. Further research is needed before we could offer recommendations for decayed leather treatment.

Mold infestation of book covers can be reduced by dry cleaning.

Book Bindings

The binding holds together the quires of a book. It consists of threads, with or without metal clasps, and may also contain other elements, such as spine lining etc. In most cases a binging is only partly destroyed and thus must only be partly restored.

The minimal intervention principle suggests that a distorted binding is not a sufficient reason for opening it, but quires that fall out must be reconnected to the book block. In case the inner material of the stations is broken, it can be prolonged and reconnected to the cover.

In case binding cannot be remade – for example, for individual loose sheets in a tight structure – pasting of such sheets can be one possible solution.

Book Block

The book block usually holds most of the information contained in the book. It consists of the pages with text or images.

Any loose material must be attached to the book again. This may include isolated pages or whole quires which are at risk of falling out, or attached elements, such as pasted-in pictures, page elements, book markers, etc.

There is no need to size with glue or cellulose ethers the entire book block as a preventive measure.

Mold infestation of blocks may be reduced mechanically with dry sponges.

Insect infestation can be treated by brushing out the insects and the larvae and eggs.

The book block may be made of wood pulp paper, which would be by now acidic and brittle. Such material decays due to its composition. Proper environment may help prolong life of such material, but cannot completely stop its decay. Where such books containing wood pulp paper are at issue, the applying conservator-restorers are invited to come up with suggestions for treatment. Although considerable research on the subject is going on in many European countries, no definite recommendations have be suggested so far for possible treatment for such books, therefore, any suggestions handed in by conservator-restorers should be discussed and decisions taken on the basis of such discussion.

Another type of damage requiring urgent measures that may be encountered in the books in question is the ink corrosion in manuscripts. Much like the acidic paper which contains material causing its damage, inks may also contain material causing paper to decay. Some techniques slowing down this process are available, but they are not easily applicable to a bound book. Furthermore, some material compositions do not allow for their application.

In case books containing such inks are among the books to be treated, conservator-restorers are invited to offer their suggestions. Pros and cons will be discussed with them and final decisions will be taken in the team.

Unbound Archival Material
All the considerations concerning the book block hold true for unbound material. The difference is that the absence of binding allows for application of single-sheet treatment techniques which are less problematic. Ink corrosion treatment is one example of the case in point.

5.3 Choice of Conservation Material

Material should be chosen according to the provisions of ethical codes of conservation-restoration. According to E. C. C. O. Professional Guidelines, "[t]he Conservator-Restorer shall strive to use only products, materials and procedures which, according to the current level of knowledge, will not harm the cultural heritage, the environment or people. The action itself and the materials used should not interfere, if at all possible, with any future examination, treatment or analysis. They should also be compatible with the materials of the cultural heritage and be as easily and completely reversible as possible."

Applicants are kindly requested to hand in a short application that would contain an outline of their conservation-restoration approach, a justification of the suggested treatments as well as the time and cost estimate. We furthermore ask for a short description of the professional background and experience in the field in question.

6 Feedback and changes of recommendations

This was subject of a document written by a professional conservator, however, the discussion of its contents that is highly desirable and is much hoped for, would have to take place elsewhere.

7 Conclusion

EtO offgasing could not be detected, neither from the books fumigated in the past nor from the books which served as test material. However

as it is not possible to get the concrete data of fumigation from the Polish partner, this part of the project must be repeated in another research project.

Although EtO fumigation is a successful method of disinfecting books already infested by microorganisms, it is not a preventive technique, as it has been shown that previously fumigated material may become infested again.

New disinfection methods could not be fully tested within the timeframe of the project.

The collagene fibres were damaged after artificial aging as well as be EtO fumigation. International discussion on minimal intervention in conservation was not done.

References

Larsen et al. (1993a) René Larsen, Marie Vest, Kurt Nielsen: Determination of hydrothermal stability (shrinkage temperature) of historical leather by the micro hot table technique. In: Journal of the Society of Leather Technologists and Chemsits, 77, 1993, pp. 151–156

Larsen et al. (1993b) René Larsen, Marie Vest, Kurt Nielsen: Determination of hydrothermal stability (shrinkage temperature). In: STEP Leather Project, Second Progress Report, 1993, pp. 69–70

Larsen et al. (1996) René Larsen, Marie Vest, Dorte Vestergaard Poulsen and Ulla Bøgvad Kejser: Determination of Hydrothermal Stability by the Micro Hot Table Method. In: ENVIRONMENT Leather Project, European Commission, Research Report Nr. 6, ed. René Larsen, 1996, pp. 145–165

Larsen et al. (2002) René Larsen, Dorte V. Poulsen and Marie Vest: The Hydrothermal Stability (Shrinkage Activity) of Parchment Measured by the Micro Hot Table Method (MHT). In: Microanalysis of Parchment, ed. René Larsen, 2002, pp. 55–62