

EBU Technical Recommendation R101 -1999

Storage conditions for preservation of motion picture film and accompanying magnetic sound material for broadcast organisations



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The EBU, considering that:

- a) Most broadcasters store film under archive conditions designed to give it a life of around 10 years^{*},
- b) Today, most broadcasters have film collections with programmes originated on film more than thirty years ago,
- c) Acetate base film and accompanying magnetic sound can suffer from a chemical decomposition called “the vinegar syndrome”, [1]
- d) The storage conditions in many broadcast archives have lead to the development of the “vinegar syndrome” at levels where the decomposition rate is increased and the usable lifetime of the material is dramatically reduced,
- e) Magnetic sound on acetate base is the material most susceptible to the vinegar syndrome,
- f) Recent knowledge and experience on the preservation of motion picture film is given in EBU document Tech 3289 [2],

The EBU recommends that:

- a) EBU Members review the conditions under which they store their film collections, taking into account the time which material has already been stored and the planned future use of the material,
- b) EBU Members should urgently check and continuously monitor their film collections for signs of the “vinegar syndrome”,
- c) Storage conditions for film should be optimised for the preservation of endangered material. These conditions will also be suitable for newly shot material,
- d) EBU Members should follow the basic storage recommendations given in **Appendix 1**,
- e) Members needing more detail information should consult EBU Tech. 3289 [2]

Bibliography

- [1] EBU Recommendation R74-1993: **The vinegar syndrome and the storage of cinefilm**
- [2] EBU document Tech. 3289: **Guidance on storage, preservation and reuse of motion picture film and sound for television organisations.** (to be published)

^{*} The conditions were specified in EBU document Tech. 3202 part 3 1974 (now withdrawn) and other standards.

Appendix 1

Storage of motion picture films and accompanying magnetic sound in television archives

1. Introduction

In the early days of television, a number of recommendations on storage conditions for film took into account broadcasters' needs for immediate access to programme material. The conditions specified were termed "medium term" storage conditions. These conditions were aimed at storage of up to 10 years. Many broadcasters still store film at these conditions and some have reported serious deterioration in their film collections. The most critical problem is the base deterioration called the "vinegar syndrome". This degradation is today considered the major threat to life expectancy of acetate based films and especially the accompanying magnetic sound. Historical evidence of archiving and storing film suggests that doing nothing is not an option.

A further consideration to take account is the evidence, which suggests that the release of acetic acid vapours can have detrimental effect on ventilation plant.

2. General recommendations

The simple message on storage of processed acetate based motion picture material is:

Keep the film and accompanying sound cold, dry and clean.

There are some critical facts and values:

- a) Relative Humidity below 20%RH must be avoided to prevent permanent damage from brittleness,
- b) Relative Humidity up to 50%RH will cause a faster development of vinegar syndrome and dye fading but will otherwise not harm the film,
- c) Relative Humidity above 60%RH, for prolonged periods, will encourage fungal growth in the gelatine layer,
- d) Gaseous contaminants such as sulphur dioxide, hydrogen sulphide, nitrogen oxides and solvents can cause degradation of emulsion and base,
- e) Stored film and magnetic materials act more quickly to temperature variations than to humidity variations,
- f) The oxide layer of magnetic sound material acts as a catalyst for the vinegar syndrome. This is known to increase the degradation rate and affect neighbouring material,

3. Specific recommendations

In considering storage conditions, broadcasters should first of all evaluate the condition of their existing archive collection and the expected lifetime over which it may be reused.

An archival collection will have categories of material ranging from fresh film to endangered old material. The different categories can be stored at different conditions to meet the desired usability. For the «actively degrading» category, showing the vinegar syndrome, it will be important to establish cold storage condition to slow down the chemical reaction, whilst for more recent fresh film, the temperature conditions are less demanding. The individual broadcaster will have to decide either to establish different storage conditions for the different categories or to choose one condition for the whole collection. This is a decision

very much related to the individual situation and the size of the archival collection. The values listed in Table 9.1 are considered to be practical lower values to be aimed at for storage conditions for actively degrading film. Experience in complexity and cost of installation and the operational consequences for reuse are taken into account. Degrading film with permanent value must however always be considered as a restoration object and stored at colder storage conditions.

Table 1: Storage conditions for acetate based motion picture film and accompanying magnetic sound material

Layer (image or sound)	Base	Temperature	Temperature stability	Humidity	Humidity Stability
Silver	acetate	+5°C	± 1°C	25-30%RH	±5%RH
Silver	polyester				
Colour dye	acetate				
Colour dye	polyester				
Iron oxide	acetate				
Iron oxide	polyester				

Notes to Table 1.

- a) In reading Table 1 it should be noted that, in general, each ~6 °C higher temperature will halve the usable lifetime and each ~6 °C lower temperature will double the lifetime.
 - b) Increasing the Relative Humidity from 25 to 50% RH will typically reduce the usable lifetime by a factor of two.
 - c) Film and magnetic sound material on acetate base which smells of vinegar, will have a lower usable lifetime than predicted in Notes a) and b) above, due to an accelerated non-linear degradation rate.
 - d) See EBU Tech. 3289 [2] for more details of storage requirements and usable lifetime.
 - e) Motion Picture film and accompanying magnetic film stored under these conditions must have an acclimatisation (staging) period in and out of the vault to avoid condensation. The time needed for this will depend on the film gauge and the size of the roll. 24 hours is considered sufficient in most cases.
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