



KODAK RELIABLE IMAGE TIP # 73

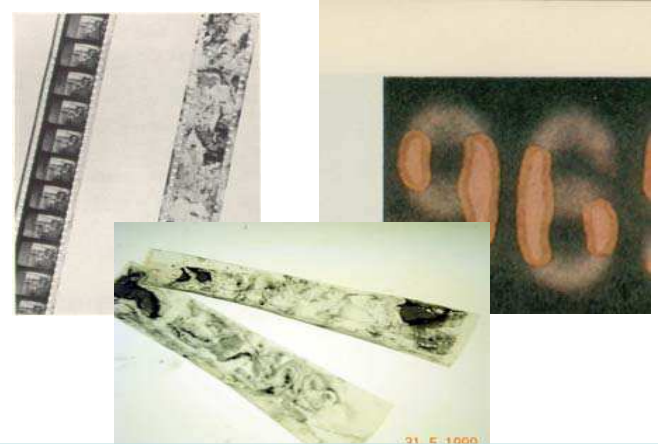


Signs of Microfilm Deterioration

- **Below are guidelines for inspecting archived microfilm. Also included is a list of typical signs of film deterioration along with a picture of the deterioration.**
- **Please also note the suggested resolution to each problem.**

Inspection

- Film degradation will usually occur from the **outside** to the **inside** of the roll.
- **Loosely wrapped** film on a reel will perpetuate degradation faster due to the air pockets within the convolutions.



Inspection

- Many films have been damaged by **careless handling** that resulted in scratches, tears and surface pollution.
- Handlers must use **gloves**, equipment must be clean and no smoking around film.



Inspection Needs

- Microscope

- 7X to 10X Eye Loop

- Gloves

- Rewind Station

- Light Source



**“CLEAN ALL
EQUIPMENT BEFORE
AND AFTER INSPECTING
CONTAMINATED FILM”**

Inspection Needs



**“DO NOT USE A
FILM READER
TO INSPECT
CONTAMINATED
FILM”**

Inspection Form

PRESERVATION FILM INSPECTION FORM

[illegible]

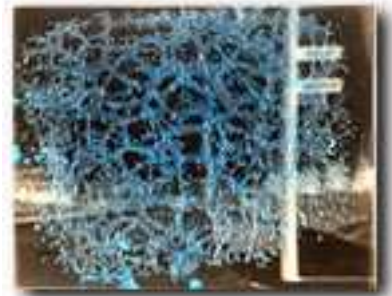
Available from Kodak

Signs of Deterioration

Sign: Blue color on sheet film.

Problem: Acid from cellulose acetate deterioration causes antihalation dyes (colorless when film was processed) to return to their original pink or blue colors.

Resolution: Silver duplicate and Brown Tone



✓ **Sign:** Brittle cardboard film storage boxes.

Problem: Destruction of cardboard by hydrogen chloride gas (hydrochloric acid) was released by deteriorating vesicular film manufactured in the 1960s.

Resolution: Boxes may not be acid free, replace



Sign: Crystalline deposits on film.

Problem: Plasticizers used to make film as non-flammable as possible are oozing to the surface.

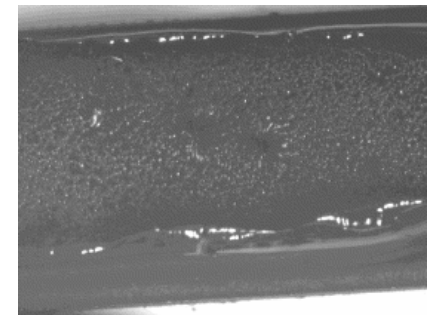
Resolution: Silver duplicate and Brown Tone if possible



✓ **Sign:** Embrittlement of the film.

Problem: Deterioration of cellulose acetate film base.

Resolution: Silver duplicate if possible and Brown Tone



Signs of Deterioration

Sign: Faded edges on the film.

Problem: Chemical reactions involving metallic silver.
Acetate film base deterioration produces acetic acid, which fades color dyes in color film.
Cellulose nitrate film deterioration.
Fading of dyes in diazo film.

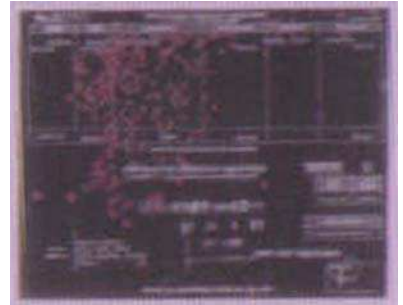
Resolution: Silver duplicate and Brown Tone if possible



✓ **Sign:** Gold-colored circular tiny dots (with red nuclei visible through a microscope).

Problem: Redox blemishes (or “measles” or “red spots”) resulting from oxidation of the silver in the film.

Resolution: Silver duplicate and Brown Tone



✓ **Sign:** Gold or rust-colored blobs, wavy lines that appear solid

Problem: “Silvering” or “mirroring” resulting from oxidation of the silver in the film.

Resolution: Silver duplicate and Brown Tone

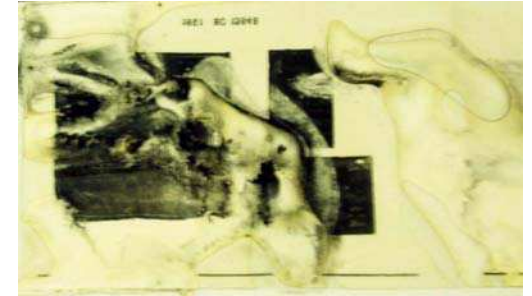


Signs of Deterioration

Sign: Liquid-filled bubbles on the film.

Problem: Plasticizers used to make film non-flammable are oozing to the surface of the film.

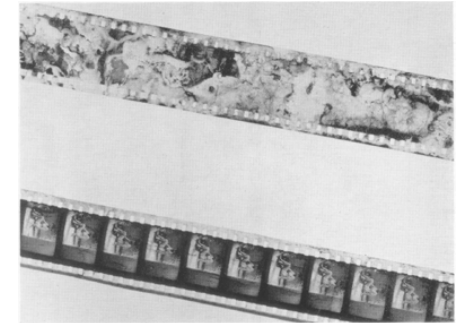
Resolution: Silver duplicate and Brown Tone if possible



✓ **Sign:** Mold growth on film.

Problem: Growth of mold on gelatin emulsion, the result of high humidity and temperatures.

Resolution: Silver duplicate and Brown Tone (do not attempt to re-wash)



✓ **Sign:** Obliterated images.

Problem: Diazo images have completely faded.

Silver images have been chemically destroyed.

Vesicular images have been destroyed by heat or pressure.

Resolution: Silver duplicate and Brown Tone if possible

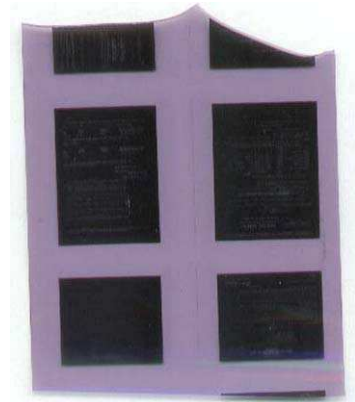


Signs of Deterioration

Sign: Pink color on sheet film.

Problem: Acid from cellulose acetate deterioration causes antihalation dyes (colorless when film was processed) to return to their original pink or blue colors.

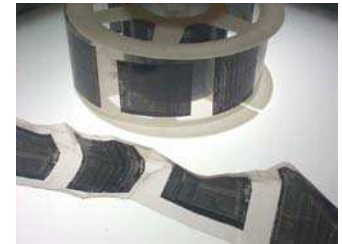
Resolution: Silver duplicate and Brown Tone (do not attempt to re-wash)



✓ **Sign:** Rusted metal storage cabinets.

Problem: Caused by release of hydrogen chloride gas (hydrochloric acid) from older vesicular films and acid from acetate films.

Resolution: Replace cabinets per Standards ISO 18902, ISO 14523 and ISO 18911.



✓ **Sign:** Shrinkage of the film.

Problem: Cellulose acetate base deterioration.

Resolution: Silver duplicate and Brown Tone if possible

✓ **Sign:** Sticky, soft film.

Problem: Acetate base disintegration.

Resolution: Silver duplicate and Brown Tone if possible

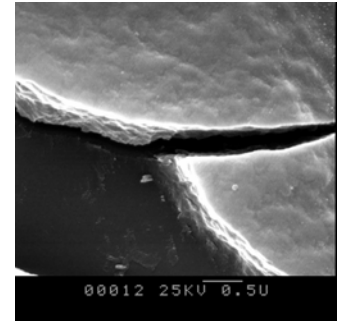


Signs of Deterioration

✓ **Sign: Torn film or easily torn film.**

Problem: Embrittlement of the film caused by the deterioration of cellulose acetate film base.

Resolution: Repair all tears and splices with approved splicing materials per Standard MS23-1998



✓ **Sign: Vinegar odor.**

Problem: Vinegar syndrome: the chemical deterioration of cellulose acetate base, resulting in the formation of acid (vinegar is a 5% solution of acetic acid in water).

NOTE – It is imperative that any microfilm showing signs of vinegar syndrome be removed from the collection immediately since it can cause other acetate films in the area to begin to deteriorate in the same way.