The Maintenance of Microfilm Files

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IN spite of many advantages, it must be recognized that microfilm is a more delicate record medium than paper. Brittle film is easily broken; it can be scratched readily in normal reference use; it is probably more susceptible to damage from excess moisture in the atmosphere than paper. Many of these hazards are the result of the miniature size of the document image. A scratch or small spot of mold that is scarcely noticeable on a paper record might seriously impair the legibility of a microfilm image. A small particle of grit on the optical flats of the reading machine may cause a serious scratch through thousands of microphotographic images. Although film that has been immersed in flood waters for days can be restored to usable condition more readily than paper records, the major hazard to microfilm records appears to be the growth of molds or fungi favored by slight excesses of moisture in the atmosphere. In parts of the country where the climate is generally damp, the life-expectancy of film records will be shortened compared to films stored where the climate is reasonably dry. Climatic conditions that promote the growth of mold or mildew on book bindings will also cause mold on film. It must be remembered that the photographic image is contained on the film in a layer of gelatin, the same substance used by bacteriologists to cultivate micro-organic growths. The miniature reproductions of records on film may be irreparably damaged by moisture-favored micro-organisms feeding on this gelatin. Such damage is not confined to one or two images, as in the case of broken film, but it may spread to an entire collection of films involving thousands, if not millions, of images.

The foregoing is not intended to arouse doubts as to the practicability of using microfilm for the preservation of long-term records, but to emphasize that prolonged exposure to excess humidity is a greater hazard to film than excessive dryness. The few known cases of film damage seem to have been caused by fear of brittle film and an excess zeal to provide moisture when it was not needed. A better understanding of the atmospheric conditions required for

maximum life-expectancy will simplify the problems of selecting adequate facilities and equipment for film storage.

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According to the National Bureau of Standards, the optimum atmospheric conditions for the storage of microfilms are the same as those for paper records — 70° to 80° F., and 50 percent relative humidity. Where the film can be stored in "air-conditioned" space, these requirements are satisfied for all practical purposes. Where the entire room is not air-conditioned, a cabinet specifically designed for microfilm storage is sometimes equipped with a tray for chemicals or other devices intended to make the humidity of the air inside the cabinet independent of the room atmosphere. The efficacy of these devices has been questioned in recent years, until today there are two schools of thought on this subject. One holds that such cabinets should be provided with some method of controlling the humidity; the other holds that in most parts of the continental United States such devices not only add unnecessarily to the cost of the storage cabinets, but through improper maintenance, increase the probability of excess humidity for sustained periods of time.

In the early 1940's, most microfilm storage cabinets were constructed with a drawer less than two inches deep, in which a saturated solution of sodium dichromate crystals was maintained in a shallow tray. Above this small drawer, there were usually nine drawers, approximately four inches deep, for the storage of the microfilm rolls. Some cabinet manufacturers furnished a porous block or slab of sandstone in place of the sodium dichromate crystals. This avoided the splashing and overflowing of solutions common where the sodium dichromate method was used, but it provided only a one-way method of increasing the moisture in the cabinet by evaporation in the winter months. The porous block was not effective in reducing the humidity in the summer months when the outside atmosphere usually exceeded the 50 percent optimum.

In theory, at least, the sodium dichromate would provide a two-way control. When the solutions are properly maintained to insure the presence of some undissolved crystals, moisture will evaporate from the solution if the relative humidity falls below 51 percent; and, conversely, moisture will be absorbed whenever the humidity rises above that point.

In practice, however, both systems depended for their success on the care and intelligence with which the devices were maintained.

Attendants added water to the porous blocks in the middle of a humid summer or they added water to the sodium dichromate tray long after the last crystal had been dissolved. Since there were cracks around all edges of the drawer-front, the outside air leaked into the cabinet, placing an additional burden on any remaining undissolved crystals. In time, the overflowing solution corroded the sliding drawer so that it could no longer be opened and all attempts at maintenance were abandoned.

About 1946 one cabinet manufacturer designed a film storage cabinet containing, in addition to the nine drawers for film storage, a drawer of equal depth in which could be placed a series of containers for the sodium dichromate crystals. All drawer openings were faced with rubber gaskets to provide a reasonably air-tight seal, and the film-storage drawers were designed to permit maximum circulation of air within the cabinet. Where the storage cabinet is to be used in air-conditioned space, a standard film storage drawer may be supplied in place of the drawer for the humidifying chemicals, increasing the film storage capacity about 10 percent over the standard 9-drawer unit.

Since other manufacturers have announced their intention of discontinuing attempts to supply "humidified" microfilm storage cabinets, the purchaser must choose between a cabinet with or without provisions for humidity control. The decision will depend largely on the answers to the following questions:

1. Do local climatic conditions appear to warrant control of humidity in each film storage cabinet?
2. Will it be possible to maintain the desired percentage of relative humidity over a period of years?

If difficulty is experienced each summer in your locality with the formation of mildew on the bindings of books and leather goods, the answer to the first question would be that some form of protection for valuable film records against excessive moisture should be provided. Although it might be argued that the life-expectancy of paper records is equally affected by excess moisture, the fact is that the added cost of storage cabinets with an adequate humidifying device is small compared to the cost of providing equal protection for paper records.

If climatic conditions appear to warrant the extra protection of the humidified cabinet, proper maintenance must also be provided. One large user of the new type of humidified cabinets has simplified the maintenance problem by establishing a rule that water should

never be added to the crystals by the attendant. The chemicals are simply permitted to absorb excess moisture from the atmosphere. This provides, initially, a one-way correction — reduction of the moisture during the summer to 51 percent. The moisture thus absorbed may not be sufficient to correct fully for moisture deficiency in the winter months, but it does afford protection against the greater hazard of excess humidity. When water is never added by the attendant, the use of sodium dichromate might more properly be termed a "de-humidifying" process. There is no danger, however, since the absorption of moisture by the crystals stops at 51 percent relative humidity. It simply avoids complete failure of control of moisture in *both* directions, which would result if all the crystals were completely dissolved.

The maintenance of the chemicals in a manner that will insure full control of moisture *in both directions*, however, should not be difficult, provided water is added sparingly; fresh chemicals are added when needed; the containers for the chemicals are deep enough. Perhaps the most important point to be impressed on the persons responsible for maintenance is that the natural excess of moisture when the humidity exceeds 51 percent will furnish most of the water requirements. A quarter inch of water will usually be sufficient when a fresh supply of chemicals is placed in the containers.

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Whether the microfilms are stored in air-conditioned space, in humidified cabinets, or without any attempt at humidity correction, the films should be examined periodically for any of the following conditions: unusual odors, mildew or mold, rusty spools, discolored or faded images, buckled film or fluted edges, brittle film, and dust or fine powdery substances.

The causes of many of the above conditions are of such technical nature that their determination should be left to competent photographic chemists or physicists. To most photographic technicians, for example, the distinct odor of "hypo" is easily recognizable. Its presence in a microfilm storage cabinet may indicate that some of the film may not have been thoroughly enough washed. The photographic images on such films may not only be fading, but there is also the possibility that these rolls containing an excess of hypo may be a source of contamination for films that had been satisfactorily processed in the first instance. With modern microfilm processed in laboratories with well-established systems of control, ex-

cess hypo is highly unlikely. Some otherwise well-appointed laboratories have been known to store their master negatives close to chemical-mixing rooms and film processors. An alert technician will recognize that, if the odor of hypo can be detected in the film storage room, there is a very real danger of recontamination of adequately processed film. Mold, mildew, rust, and most of the other results of excess moisture are usually easily recognized. A good test for brittle film is to bend the film two to six times, without actually creasing at the fold. If the film breaks easily, it is too dry and should be reconditioned.

The frequency and extent of the periodic inspection of the film will depend on the following factors: the importance of the microfilm records; the existence of duplicate film copies; the frequency of normal reference or other use; and the conditions of film storage. The great bulk of the film produced by banks and department stores in connection with current accounting procedures is probably rarely consulted after a year or two. The same is true of some substantial accumulations of film in Government agencies. No elaborate procedure for the inspection of such films is recommended. They should, rather, be disposed of as frequently as similar records in the bulkier paper form. When the records are of long term, but not permanent value, films should be inspected about once every year. This might be on a sampling basis of one roll from each drawer of a microfilm storage cabinet, but a ten percent sampling would be preferred. If trouble is detected, all rolls in a film collection may have to be inspected by a competent technician. When the records are of genuinely permanent value, there will usually be two film copies, the master negative and a "working" or reference copy in the form of a duplicate negative or positive film print. It is recommended that the master negative be deposited where it will be stored under rigidly controlled conditions. Annual inspection of the reference film is still recommended on a minimum sampling basis, unless frequent use of the film would reveal significant changes in the film's condition.

When the reference use made of the microfilm is insufficient to warrant the cost of duplicate film, the custodian should be doubly alert. He must be on guard against damage to the microfilm in normal reference use and he must bear in mind that the effects of adverse atmospheric conditions are often more serious if the microfilms are *infrequently* consulted. In either case, annual examination of the film files is strongly urged.

The detection of physical or chemical changes in the film is not the only purpose of the periodic inspection. Since a roll of film, small enough to fit the palm of the hand, may represent as many as five large volumes of court records or three-fourths of a drawer of correspondence files, the misfiling of a single roll may result in the temporary loss of a substantial number of records. The periodic inspection offers a good opportunity for checking on the following additional points: (1) are the labels on the drawer front correct? (2) are the rolls in proper sequence within each drawer? (3) have any of the rolls been "charged out" for an unreasonable length of time? (4) are any of the film records eligible for disposal? (5) are carton labels coming loose? (6) should chemicals be replenished? (If humidified cabinets are used.) (7) are the film storage cabinets too close to radiators or exposed to direct sunshine which might cause high temperatures in the summer months? (8) are the film storage cabinets located directly under water or steam pipes which might develop leaks?