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Quality Management of Microfilming Projects

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YELLOWSTONE PARK

I would like to tell you something about my work as quality manager microfilming and about the high quality standards for substitute microfilming we apply within the Dutch preservation programme Metamorfoze. Let me start with going back in time a bit. To be precise, to the year 1870. In this year, William Henry Jackson went riding into the hills of Wyoming, USA. Jackson was the chief photographer for the Hayden expedition. The aim of the Hayden expedition was to record the area as minutely as possible, in order to convince politicians to turn this area into a national park. There were two Hayden expeditions: in 1870 and in 1871. For both of these expeditions William Henry Jackson was the chief photographer. In 1872, the area was indeed proclaimed a national park as a result of the expeditions. And the pictures William Henry Jackson took played an important role in this US government decision.

The reason I'm telling you this is not because I want to chat about the beautiful environment of Yellowstone National Park, nor do I want to emphasize the fact that it was quite an achievement that William Henry Jackson was travelling into the Wild West on horseback and coach without breaking the glass negatives he used. It’s because I would like to focus your attention on the fact that today we still have access to these photographs made by Jackson and many others of his colleagues from the early days of photography, due to the excellent conditions under which these materials have been kept all this time. Without any doubt, these photographs have an important cultural and historical value.

METAMORFOZE

The microfilms, which are being made for Metamorfoze, are of great historical and cultural value too. The films contain books, newspapers, periodicals and manuscript collections from libraries and other heritage institutions all over the Netherlands from the nineteenth and twentieth century. All microfilms produced for Metamorfoze are kept with the greatest care in cold storage in the Koninklijke Bibliotheek, the National Library of the Netherlands (KB). The KB stores about 14.000 microfilms. But before these microfilms can be placed in the KB storage rooms, a lot of work has to be done to produce them. Each film numbers about 500 exposures. In all, it makes 7 million

exposures. Each film and every exposure on it has been checked for completeness. The films are also checked very detailed on technical quality by the microfilm company that produce them and by the quality manager microfilming of Metamorfoze. This is a full time job.

SUBSTITUTE MICROFILMING

How do we check this and why is it so important? What is substitute filming? What happens with the originals after they have been put on microfilm?

The technical quality of the microfilms is important because they are used as substitutes of the original documents. Substitute microfilming means that the microfilm can replace the original. After microfilming, the original often can no longer be consulted because of its bad condition. Paper documents dating from the period between 1840 till 1950 suffer from a form of decay that increases with the years and it will eventually lead to the destruction of the originals.

Metamorfoze aims at preserving the originals after microfilming as good as possible. They are acid free wrapped and boxed and placed in the repositories of the libraries where they are kept under optimal conditions. The originals are supposed to remain in these repositories, and not to be consulted again. From then on users are supposed to consult the substitute microfilms instead. This is why the content of the microfilm needs to be almost identical to the original. The physical state of the paper itself, the colourings, differences in the blackness of letters in old newspapers, or thin pencil stripes in manuscript material or illustrations need to be seen clearly. In fact, the microfilm *is* the new original.

At the start of the Metamorfoze programme in 1997 substitute microfilming was completely new for the companies involved. These companies worked mainly for hospitals, registry offices etc. These kinds of institutions normally require legible films, and not very much more. Density of microfilms or illumination was not an issue. It was a major cultural change for these companies. A change that also required technical investments. So the companies not only needed to use different methods of processing microfilms, but the operators working at these companies needed to have more knowledge of photography in order to be able to deal with the differences in density of the originals. In cooperation with the Koninklijke Bibliotheek these companies developed low contrast microfilming. Low contrast microfilming shows all details from the original on the microfilm. Besides the technical differences between substitute microfilming and the regular activities of the microfilming companies there is also a substantial difference when it comes to handling the microfilm. With substitute filming

the microfilm is stored for a great many years, whereas the companies often get rid of their films or destroy them, as soon as the keeping time set by the tax office expires. So we are dealing with microfilming for the long term, for preservation.

PRESERVATION MICROFILMING

With preservation microfilming a difference is made between first, second and third generation films. By a 'first generation' film we actually mean: a master negative (or camera negative). This is the film that is produced by the microfilm camera. For *Metamorfoze* these microfilms are the immediate replacement of the originals. The microfilms are stored in cold storage rooms under optimum conditions, where they are supposed to remain for decades. Keeping an atmospheric humidity of 30 percent and a temperature of between 5 and 8 degrees Celsius, these films can be stored up to 200 years, perhaps even more. But before these first generation microfilms are put away in cold storage, duplicates are made of these films: these are used as working copies and are referred to as 'second generation' films (or duplicating copies). Within the *Metamorfoze* project, these copies always have positive polarities. These working copies are used to make all subsequent users' copies, the 'third generation' of microfilms. For these third generation films a certain quality and readability is required. We have to take into account that with every duplication of a microfilm information gets lost. You can compare it with making a photocopy of a black and white photograph on a photocopying machine. If you use a good machine, the copy may be quite reasonable, but when you make a copy of this copy and compare it with the original photograph you'll notice that many grey tones are lost. The same thing happens when you duplicate films. Fortunately it doesn't happen to the same extent, but the fact remains that with every new generation information gets lost. So, for the first generation of microfilms quality demands are set to a very high level to guarantee a reasonable quality of the subsequent second and third generation copies.

For the Metamorfoze programme standards have been developed. These are based on the existing standards for microfilming of monographs, periodicals, newspapers and manuscripts of the KB and on the standards for substitute microfilming of the National Archives. Besides this, international standards and guidelines were incorporated if necessary (International Organization for Standardization, Research Libraries Group, The Andrew W. Mellon Foundation). The demands regarding technical quality concentrate on three items: density, resolution, and illumination.

Density

Density is the extent in which light gets filtered by the film and the images on the film. This can be measured by placing a light source at one side of the film and a metre at the other side of the film. Density is measured in logarithmic values. In photography we often refer to the density of a negative. If a negative has a normal density the exposure was done well, but a negative can also have low density, which means it was underexposed. Or a negative has too high density. Which means it was overexposed. The developing of the film also plays an very important role regarding density. We have the ideal density if the image uses the entire palette of the film.

This means that all the tones between black and white are used. In order to indicate the degree of density the minimum and maximum limit are referred to. The operator then needs to illuminate the originals in such a way that the minimum and maximum density keep within the set ranges. In general the right density fluctuates between 1.00 and 1.50.

On the whole there are two ways of microfilming a collection of paper documents: high contrast and low contrast. High contrast means that the exposures have relatively a few grey tones. So, there are relatively few grey steps between black and white on the film. For this way of filming we normally use HDP13 film. This type of film contains about 7 or 8 grey steps between black and white, which differ greatly. So there is, so to speak, high contrast between the various stages of grey. Generally speaking high contrast objects should be filmed using high contrast films. With a high contrast of the object, I mean the contrast between the letter and its background. In newspapers, for example, you normally find bold heavy types set against an almost completely white background. The contrast between them is very high. This type of microfilming is normally used for monographs and newspapers. Low contrast microfilming means that there are relatively many grey tones between white and black. So the contrast between the various grey steps is low. In general, low contrast objects should be filmed low contrast. A type of film that is used frequently is the Rapid AHU. This film is more rapid, more sensitive to light than HDP13 films. For this type of film the amount of grey steps fluctuate around 12 to 13. This type of filming is used for manuscript material and illustrated magazines

Both types of film require their own methodology of processing. Both the choice of chemicals and the degree of dilution are aspects that determine what the final product will be like. But also the machine used for developing and its velocity and temperature are essential. For the *Metamorfoze* programme each of the three companies we deal with have developed their own methodology for low contrast filming.

The Metamorfoze density guidelines for high en low contrast microfilming are

High contrast: 1.30 – 1.50

Low contrast: 1.00 – 1.20

Resolution

Resolution is the ability of the microfilming system to record fine detail. To judge the resolving power of the camera optics with the film used exposure, processing etc. a standard ISO resolution test chart is filmed at the beginning of each film. The chart has to be placed in the middle and in the corners of the image. The resolving capability is expressed in line pairs per millimetre. The number of line pairs per millimetre is determined by multiplying the number that appears above the smallest pair of line patterns discernible on the resolution test target by the reduction ratio at which the resolution test target was filmed. For example, if the number of the smallest pair of line patterns discerned is 5.6 and the reduction ratio is 20. The resolving capability would be 112 line pairs per millimetre. This is quite low. A very good resolution should be more then 120 lines per millimetre. Normally it is possible to reach a resolving capability of 150 to 180. It depends on the quality of the film which is used.

This technical target is also used in determining the Quality Index of the film. Quality Index (QI) is a method of relating the type size of printed material to be filmed to the resolving power of the microfilming system in order to insure the highest possible level of legibility over the desired number of film generations. It uses the technical target to simulate the lowercase "e" and is expressed as having three levels: high quality (QI 8.0), medium quality (QI 5.0), marginal quality (QI 3.6).

The *Metamorfoze* guidelines require a Quality Index rating of high quality (8.0) to be maintained over the three generations of film. Generally resolution declines at a rate of about one test pattern per generation. So a 10.0 test pattern on the master negative frequently declines to a 9.0 test pattern on the duplicating copy and to an 8.0 test pattern on the third generation, the service copy. So we require for the master negative a Quality Index of 10.

Illumination

To safeguard a right illumination over the entire exposure on the film, a white illumination test chart, as big as the film frame is filmed. After processing the film the density is measured in the middle and at the corners of the film. The middle and the corners cannot differ more than 0.10 in density to each other. In this way the whole film frame is checked. After all, the book or newspaper can shift or move a little by turning the pages. There is another rule, which says that the original should be filmed as frame filling if possible. So, there is not much leeway beyond the size of the original. This is why the entire frame size is considered when the film is checked on illumination and resolution. This is a very important issue and causes a lot of discussion with the microfilming companies. Especially when filming large-size originals, for example newspapers it is difficult to reach the set standards especially with regards to

illumination. Besides, it is also very difficult to maintain an equal standard of illumination for a longer period of time. Someone may bump into a light source and the illumination gets all wrong again.

OTHER DEFECTS

Besides these three main issues we also check on splices, scratches and other defects, and skew

Splices

Metamorfoze guidelines require that ultrasonic splices be used on master negatives; thus no splices occur in the second and third generation. The total amount of splices may not be higher than 6. Splices are used to fix technical errors and errors with respect to the content of the material. Operators try to limit the number of the splices as much as possible. Nowadays it is suggested to fully prohibit splices in films to facilitate scanning. But, as far as I can judge, splices need to be possible, because the standards are set so high that corrections need to be possible.

Scratches and other defects

All generations of film must be free of scratches, gouges, blemishes, dust, dirt, fingerprints and other defects. The films must be handled with extreme care from the time that the first generation negative is loaded in the microfilm camera to the time that the third generation service copy is shelved in a microfilm reading room. Every time a film is handled wearing gloves is necessary.

Skew

Metamorfoze guidelines have so far allowed skew up to 10 percent or 9 degrees. From parallel with the longitudinal axis of the film. Most films produced never come close to that range.

TECHNICAL INSPECTION

To check whether the mother negatives comply with the requirements, we perform technical inspection on-site at the microfilming companies. These inspections take place

quite regularly, about once every two weeks. For the companies this is a burden because we are using their machines for this inspection. But the advantage of doing these checkups at the companies is that if technical problems do occur, they can be discussed with the production manager involved right away. Furthermore, any questions and remarks involving the collection that is being filmed at that moment can also be dealt with at once. Sometimes decisions made before starting a microfilming project may have to be changed when filming is in process. With every five films one is checked for technical flaws. If structural flaws are detected more films will be checked.

REJECTING FILMS

If a film does not meet the requirements this film is rejected and a new film has to be made. If it looks as if within one batch several films have the same technical flaws the entire batch is returned. The company is requested to properly check the batch and have it examined again. If the whole batch turns out not to meet the requirements, the whole batch is rejected. In such cases it is important that things are discussed in detail with the production manager of the company, and to establish why the internal checks did not reveal the faults. It is important that both in-company and external controllers check films with equal accuracy. Illumination, resolution and density also need to be checked in the same way by both controllers. It is important to see which mistakes or flaws we are dealing with, and also to consider the type of film involved. For instance, a high contrast film of an original with a heavy black letter can handle a high rise in density much more easily than a low contrast film with tiny pencil stripes.

To reject a film is a disadvantage for companies as well as for the owner of the original material. For the company the drawback is mainly economical. But there is also extra delay when one or more films need to be done again; the original documents need to be taken from the repositories again. Besides, other projects are being delayed. Another drawback is that after the reruns have been made, a lot of work is still to be done. The films have to be duplicated, or microfiches have to be made and normally this is done only after the entire batch has been completed and approved. For the library or the institution that owns the collection it is a disadvantage because the process is delayed and in the meantime the collection can not be consulted. And microfilming the originals a second time might cause extra damage.

PROFESSIONAL SPORT

So, in order to make a film that meets all qualifications, the entire path from original to users' copy needs to run smoothly. Everything, all technical aspects, need to be well prepared. The operators need to use the right illumination, the film needs to be processed

in the right way, it needs to be checked accurately, and then the film can be duplicated and service copies be made. This process is so finely tuned that if anything goes wrong, actually, if there is a slight change somewhere along the line, somebody going away on vacation or being ill, the quality of the films drops. It may be a very slight flaw, but it could happen that before this flaw is detected, quite a few films have been made with this same flaw, with the effect that the entire batch might be rejected. Accuracy is extremely important here. In my opinion substitute filming is like professional sport. The quality standards are very high and they demand the utmost from operators and their cameras. Like sportsmen, the operators need to have a drive, the drive to deliver a product of high technical quality. This means they need to be keen and alert, and prepared to make the most of their machines, technically speaking. Collection after collection, newspaper after newspaper, book after book. This is why, as far as I am concerned, requirements for substitute filming should not be increased. I am referring to the report of the Research Libraries Group, RLG Guidelines for Microfilming to Support Digitization (Dale, 2003) that has recently been published. In this report it is suggested that scanning a microfilm could be made easier by setting the requirements for maximum and minimum density higher, increasing the skew tolerance, and forbid splices. In my opinion this would lead to overtaxing of the operator. It would be better and easier to adapt scanning techniques to microfilming than to increase the requirements for substitute microfilming in order to solve the problems of scanning microfilms. Even professional sport has its limits.

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