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Splicing of film productions for long term storage

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Film splices are either made using cement or tape. The cement splice is the industry standard method for negative handling and storage, while the tape splice is only suitable for editing and should never be used on material for laboratory, telecine or archival purposes. The characteristics and properties of cement and tape splices are very well described in the paper below [1].

1. Cement Splices

Cement splices are generally reliable, even after many years storage, however they can deteriorate for the following reasons:

- the splice was incorrectly made e.g. the emulsion layer not removed correctly (i.e. there was human error);
- the film cement used was of poor quality.
- the film splicing machine was incorrectly adjusted.
- the splice has suffered "Wear and tear" damage due mishandling,
- the cement has Deteriorated due to the action of solvents.

The experience of EBU Members, together with the film laboratories is that conventional cement splices rarely give problems provided that the splices are properly made and inspected before any operations such as printing or telecine transfer. The usual problem is that splices 'dry out' causing them to separate. This occurs if the splice was not made correctly in the first place. If a splice does fail during printing, it rarely causes damage to the negative and can normally be remade.

The one unknown factor at the moment is the long-term effects of the increased use of solvents in wet-gate printing. It is thought that, if the splice is correctly made, then there should be no problems. However, there is growing evidence that splices can be weakened by solvent action, but only if the splice was not perfect in the first place. A cement splicer (Hamman) is now available which produces 'butt' cement splices without the increased thickness as for a conventional splice. As this is a recent development, there is as yet little experience of how well these splices survive.

2. Tape Splices.

Tape splices are made with a clear adhesive tape, and provide a quick and convenient method of joining film, which is especially suitable for editing. However, problems will occur if a film with tape splices is stored for any length of time. These problems relate to the properties of the adhesive used on the joining tape and include:

- Joins can stretch apart when the film is wound in rolls.
- Adhesive can ooze and may stick to adjacent turns, causing winding problems.
- After a long period of storage, adhesive can ooze from the edge of the tape joins to form a layer between the edge of the film and the film can.

Stretching normally happens slowly, over a period of weeks or months, but if the film is wound too tightly or stored at too high a temperature, it can happen in a matter of days. If a film with stretched splices is run on a machine then it may be damaged. An affected film may need to be cleaned with an approved solvent to remove any traces of the adhesive. The old tape joins should be removed and replaced.

If the oozed adhesive is still soft, the film can be treated with an approved solvent so that it can be unwound. The old tape joins should be removed and replaced.

In some cases however, the layer may have hardened and solvent treatment may not be possible. This means the film is not recoverable.

In view of the above problems, tape joins should not be used for material which will be stored for long periods, and especially on archive material which may need to be reused.

If any archive material is known to have been joined with tape splices, then the splices should be remade and the film should be copied by making:

- a master positive on intermediate film if the film was a negative;
- a reversal copy if the film was a reversal master;
- a video tape copy of either.

3. The Current Situation.

Over many years, the film industry has produced a large number of different 35 mm mechanical splicing machines which are more or less demanding on the skill of the operator for good results.

For 16 mm film, the situation is different because there is not sufficient area between film frames to make a solid, durable splice that is invisible, as can be done with 35 mm film. Therefore, the chequerboard A/B roll method of negative assembling was developed to get round the problem and it is now the established method for cutting 16 mm negative for making prints.

However, if a chequerboard negative is run on a telecine for video transfer, there will be picture unsteadiness at the scene changes because of the increased thickness at the splices which creates unwanted movement. Therefore, the A/B rolls assembled for telecine transfer have to have the scenes extended at the beginning and end. The cut to black is made electronically. This can be a problem if both video transfers and film prints have to be made from the same negative because overlaps are present in the cut negative which cannot be used on a film printer.

Many Broadcasters have established production methods where the programme is shot on film and the processed negative is transferred to video using a telecine machine. Post-production takes place wholly in the video domain. If it is decided to preserve this programme on film, the question arises of how should the negative be assembled for future use? There are three main possibilities:

1. Make a traditional chequerboard negative for printing.
2. Make a A/B roll negative with picture overlaps for telecine transfer.
3. assemble the selected takes as a "rough cut" single negative roll so that the programme can be re-assembled at some future time. A computer logging system will have to be used at the telecine transfer stage so that an edit decision list, EDL, and negative cutting list can subsequently be made.

Option 1 results in a conventional chequerboard cut negative and prints for projection or telecine transfer. Further prints can be produced later on but the negatives will not be able to be transferred to video without picture instability at the splices. This is the most expensive solution, but the most flexible.

Option 2 results in two rolls of negative that can be re-transferred using an A/B auto assembly process from telecine to tape. If a print is required then the negative will need to be re-cut to a normal printing chequerboard.

Option 3 is the least expensive way of archiving the programme. The programme can be reassembled using the EDL lists. All the "out takes" of the negative originals can be discarded and the rough cut negative can be re-transferred on a telecine without a wet-gate because it will not suffer from dust and dirt near the splices. This option will also give the possibility to re-cut the negative to make a chequerboard negative for printing.

4. The future

The conventional cement splice is still the best way to join acetate film for production and storage. The introduction of polyester film base would be good because of its better storage properties but producing a splicing system that is invisible is a challenge for the commercial industry. For the broadcaster, there are several options when using film as the recording medium. The ideal is to provide a film for archiving with no joins as can be done by making an interpositive. However this is very costly. The most practical way is to choose one of the options above which use conventional cement joins and to ensure that the joins are correctly made. Which option is chosen will probably depend the funds available for the production.

Bibliography

- [1] Brown, H.: **Film Splices**
FIAF Preservation Commission.
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