



Maintaining a valuable programme archive in the face of technological change – some pragmatic thoughts

C. Daubney (Channel Four Television)

1. Introduction

With the proliferation of television channels that has already occurred – never mind the explosion of new channels that may be about to happen – the value of the programmes in our archives acquires a greater and greater importance, daily. At the same time, technological developments – which themselves seem to be occurring at an ever-increasing rate – make it essential that each archive owner keeps a regular watch on how these developments might or will affect his archive.

Getting the technology aspect resolved to the best of one's ability – at a given point in time – is clearly a vital pre-requisite to preserving a valuable programme archive!

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The commercial value of programme archives is becoming more and more important, with the proliferation of new television channels. Ongoing developments in recording and storage technology mean that very careful decisions must be taken on how best to preserve our television archives.

In this article, the Author offers his personal views on what is required to maintain a programme archive, particularly now that digital recording and bit-rate reduction technologies are taking over. He also describes the archiving strategy that has been adopted by Channel Four Television in the United Kingdom to serve its needs over the next decade or so.



Channel Four Television is not exempt from these commercial and technical issues. We may only be thirteen years old but, by the age of 11, we had amassed a library of 60,000 programmes held on 1-inch (C-format) tapes, and a further 20,000 programmes recorded in the Betacam-SP format. In the last two years, we have had the great privilege of moving to a totally new and purpose-built headquarters which relies on the use of digital techniques; we are now starting to amass an archive on the D3 and, especially, the D5 digital formats (see Fig. 1).

2. Choosing the best archive recording format(s)

There are two pairs of signal types that face every television engineer. They are, of course:

- analogue or digital;
- component or composite.

In most cases, the best “current” combination of signal types is *analogue-composite*: most probably, everyone’s ideal “future” combination is *digital-component*. Consequently, these two primary combinations, respectively, determine the recording formats we currently use and those that we will use in the future.

However, both of the other two combinations of signal types are also found in practice:

- *analogue-component* signals are used by the Betacam and Betacam-SP formats;
- *digital-composite* signals enable a digital recording format to be used optimally in the midst of an analogue composite-based recording system.

Channel Four Television is no exception. By not coming into existence until 1982, it virtually avoided the use of 2-inch VTRs and its sole initial recording format was 1-inch tape. That remained true until, like everyone else, we came under pressure in the late 1980s to accept many different styles of programmes (not just news and current affairs) on the Betacam-SP format. However, in the majority of cases, the signal format remained mainly composite in the surrounding production/post-production processes.

Our new headquarters had always been conceived, and were then designed, on the basis of using *digital-component* techniques for all the video systems, except where it was necessary to be able to handle the older standards. So, in 1992, we faced

the challenge of choosing a digital recording format (or formats) to match our new video systems.

One key challenge stood out immediately – how were we going to handle composite-based recordings in a component-based station? The solution we chose was to decode the composite signals into components – no further along the signal path than *immediately* at the outputs of the relevant composite VTRs.

However, by 1992, another new technical challenge had entered the “format” debate, and had thus confronted us. That was whether or not to allow the use of *bit-rate reduction* techniques in the VTRs.

3. Bit-rate reduction

Let me borrow and modify a well-known quote from Shakespeare: *to bit-rate reduce, or not to bit-rate reduce, in a broadcasting centre – that is the question*. In many ways, it is the key question, as it has ramifications throughout all parts of the signal-handling and recording processes in a *broadcasting centre*, especially in the archiving areas.

My personal view is that there are two very real dangers in allowing a widespread use of bit-rate reduction in any part of a broadcasting centre:

Figure 1
Typical range of tapes currently encountered by broadcasters, from the 1-inch open-reel format to samples of the many sizes and types of cassette-based formats.





Figure 2
Channel Four's new
headquarters at
Horseferry Road,
London.

- the likely effect of cascading these unpredictable processes, especially if a number of different ones are involved, will remain unknown for some time;
- with the present rate of increase in storage capacity, both on tape and especially on disc, there will soon be no obvious need to use bit-rate reduction techniques in broadcasting centres.

The use of such techniques in broadcasting centres will not enable any capital or useful revenue savings to be made. In my experience, there are only a few programmes whose duration is such that they would require the use of a bit-rate reduction system to fit them onto a single tape. Any saving in the cost of tapes is thus quite trivial when compared with the real danger of the bit-rate reduction system causing a significant degradation in quality. Thus, there is no *prima facie* financial or technical case for using bit-rate reduction techniques in broadcasting centres.

I can understand, and accept, the argument that there is a case for using bit-rate reduction techniques in the sort of *lightweight camcorders* that are used in field applications, in order to maximize the recording duration for a given weight and size of tape cassette. I can also recognize that, when “price per megabit or megahertz” is an important consideration (e.g. in the case of signal distribution and over-air transmission networks), the use of bit-rate reduction techniques will produce real financial savings which cannot be ignored in the overall cost/technical-quality argument.

However, I have never found any similar argument which supports the use of bit-rate reduction techniques in *broadcasting-centre* operations.

Furthermore, in those operations which may use bit-rate reduction techniques and which are *external* to a broadcasting centre, the signal has to make just *one* pass through the process. By contrast, *within* a broadcasting centre, there can be *many* passes of a signal through the various facilities, and these could easily involve a number of *different* bit-rate reduction processes.

■ 3.1. **Bit-rate reduction and programme archives**

I am a realist who recognizes very clearly that *we can do nothing about the past, only a certain amount about the present, but a lot about the future!*

Bit-rate reduction techniques are now in use, some of them in areas where I believe that we may well be jeopardising our archives. We must learn all we can *now* from our experiences to date, before it is too late! Some of the current developments that are based on bit-rate reduction systems (especially in the field of disk recording technology) may well look like a sensible advance now but could become a longterm liability, especially for archiving – *a short term gain for a long-term loss!*

If, in the longer term, new bit-rate reduction techniques are developed which provide substantial financial savings to be made, without a loss in technical quality, then so be it! However, that does not change my view – indeed it reinforces it – that *at this point in time* the best way to archive our programmes is to transfer them to a non-bit-rate-reduced digital format!

With all these points in mind, Channel Four made the use of *linear* (i.e. non-bit-rate-reduced) recording techniques an essential pre-requisite when making its decisions on digital recording formats.



4. Which format(s) do you choose for your initial digital archive?

Adding together all of the above philosophical ideas, Channel Four ended up with the following solutions:

- for new programmes produced using digital component techniques, we could choose either the D1 or D5 format;
- for transferring Betacam-SP material onto a digital component format, we could choose either the D1 or D5 format;
- for any new programmes that, for one reason or another, had to be made using composite signal techniques, we could choose between either the D2 or D3 formats, or we could use a very high quality PAL-to-digital component transcoder at the output of the source device and record on either the D1 or the D5 format.
- for transferring 1-inch material, we could choose either the D2 or D3 formats, or we could use a very high quality PAL-to-digital component transcoder at the output of the 1-inch VTR and record on either the D1 or the D5 format.

Our final decision on which recording machine to purchase was a relatively easy one. As it was possible to buy Panasonic D5 VTR machines with a built-in D3 replay facility (which included a very high quality PAL-to-digital component transcoder), it made a lot of sense to adopt this equipment for Channel Four's main VTRs. (All signals which appear at the output of these D5 VTRs are in a digital-component format, irrespective of whether the tape being replayed is a digital component or a digital composite recording.) The major decision to use this equipment made the design of our new headquarters a great deal easier than it would otherwise have been!

As a result of that decision, we were also able to adopt the archiving policy which is summarized in Table 1 and which is now in the process of being implemented.

5. Conclusion

Within the last few years, Channel Four Television has had the wonderful opportunity and privilege of being able to design and build a totally new headquarters, which we were determined to make as future-proof as possible in all respects.

One of the key issues in the technical decisions we made was the future-proofing of our programme archive, at least for the next decade (and hopefully much longer!). A combination of our clear philosophies on certain key issues (such as the use, or otherwise, of bit-rate reduction techniques in broadcasting centres) and the availability of the Panasonic D5 VTRs with D3 replay facility, has solved our programme archive requirements.

I hope that these thoughts will give some help to colleagues in the EBU (and elsewhere) who are facing the same challenges over preserving their increasingly-valuable programme archives.

Format	Archiving usage by Channel Four
D5	For new programmes produced using digital component techniques
	For transferring Betacam-SP material onto a digital component format
D3	For any new programmes that, for one reason or another, had to be made using composite signal techniques
	For transferring 1-inch material onto a digital format

Table 1
Usage of VTR formats for archiving purposes at Channel Four Television.

Mr. Chris Daubney graduated in Mechanical Sciences from St. John's College, Cambridge, in 1964. He started his career by joining the BBC where he stayed for just over nine years. During this period, he worked in studio and OB technical operations, and in the studio planning and installation department. He was also a lecturer at the BBC Engineering Training Centre.

In September 1973, Mr. Daubney joined the then Independent Broadcasting Authority (IBA) as its Principal Engineer in the Quality Control Section. He was promoted to Head of Quality Control in 1981, to Head of Engineering Information Service in 1983 and finally, in 1987, to Assistant Director of Engineering with responsibility for policy and projects. In October 1988, he took up his present post as Chief Engineer, Channel Four Television.

Chris Daubney is a Chartered Engineer, a Fellow of the Institution of Electrical Engineers, a Member of the Institute of Acoustics, and a Fellow of the Royal Television Society. He also sits on the EBU Technical Committee and on the PALplus Board.

