

Tape to Film

As we embrace a new century, it's now possible to shoot a movie on tape, edit the material as data and project the finished results digitally. Yet so far, very few projects are able to take this route. What technology has made possible, the human elements – public funders, studio executives, sales companies, distributors, cinemas – tend to overlook because the industry is unable and/or unwilling to invest in films that exploit new methods. However, on balance, the process of financing even conventional films has become so complex and protracted, it's unsurprising that innovation is viewed with caution; anything outside of the norm always is – until the exception proves the contrary – Blair Witch, the Dogme movies, Timecode 2000.

In the context of the UK film industry, this position is lamentable for several reasons – first, because a failure to exploit new technology impedes production and with it, the opportunity for profit. Secondly, because it limits the aspirations of new and emerging film-makers – producers, directors, writers and actors – attempting to prove their talent in the marketplace. Thirdly, with so much film production in this country dictated by the twin pillars of public purse and the apeing of Hollywood – albeit on derisory budgets – there's little scope for truly novel, ground-breaking films that can be completed by exploiting the cost benefits and accessibility of digital. There is a coalescing of prejudices, all of them rooted in a climate of insecurity where risk taking is anathema to those in charge of policy and decision-making.

Nowhere is this more true than in the exploitation of films. It is generally agreed that while the process and means of production are more accessible than ever, digital movies are unlikely to reach their audience because digital projection facilities are virtually non-existent. At its most basic, a digital feature can easily be realised on a minuscule budget; the obstacle to exhibition is cost – the cost of transferring tape to film – restricting a movie's potential for festival and market screenings and the chance of a pick-up.

In researching digital post facilities, it appears a corporate strategy is emerging, a strategy which dictates that digital movies are great, just as long as you shoot on film, go to a digital intermediate, then back to film. Of course, there's no disputing the value of this method; chiefly in the realm of colour correction. Also the developing option to post to Cinemascope ratios without the need for 'scope equipment on the shoot.

But it's not digital film-making. It's one thing to develop a technology which makes a process faster, cheaper, better and theoretically more accessible, but it's another to drive the technology in order to impose an additional layer of expense on an already costly process. Perhaps that's why the UK film industry has yet to release an indigenous, digitally originated feature. On film, naturally.

This section deals with one of the most debated topics in digital cinema – the best route to transferring tape to film. What most people don't know is that video has been in existence almost as long as film – nearly 100 years. Historically, film, which inherently is its own storage system (you can see the picture just by looking through it), became the commonplace medium, whereas video, which relies on the quality of signal, of storage devices and means of playback, was technically more complex and advanced more slowly than its chemical counterpart.

Artefacts for arty folks

Kodak claims a potential effective 12 million pixels per frame of 35mm film, equating to a scan resolution of roughly 4K (4000 pixels per horizontal scan line). PAL video has a resolution of 720x576 leaving it prone to 'pixellation', artefacts, and a lack of sharpness. Also, the colour and contrast sensitivity, compared to film, is limited. High definition, at 1920x1080 pixels, is a huge advance but it remains to be seen how good it really is (see HD24P for our opinion). There is no doubt that pristine film is the superior medium.

The thing is, pristine film is not what goes in front of an audience. Camera negative is printed down through several stages to arrive at a show print (compromised further by the optical and mechanical limitations of

projection), reducing its inherent superiority. Conversely, transferring video, particularly HD, to film seems to obscure some of its apparent mathematical limitations.

And, of course, with a digital intermediate, where 35mm film is scanned to high definition (2K) resolution data, for colour correction and CGI, and then printed back to film, the quality of the image is limited by the data stage. You hear few arguments about the value of this process.

The Processes

Currently there are three technologies used in tape to film transfer: Kinescope, Electron Beam Recorder (or CRT recorder), and Laser Recorder. All ultimately deliver a standard colour negative, but with pros and cons to each method.

Kinescope

The oldest method is the Kinescope. Before video tape was invented, kinescoping was a method used in TVR (Television recording) to transfer TV broadcasts to film. Then, it consisted of a monochrome video monitor with a 16mm or 35mm film camera synchronised to match the speed of the broadcast images.

With the introduction of colour broadcasting, the monochrome kinescope developed into the 'triniscopes', which uses three separate RGB filtered monochrome monitors, whose images are superimposed onto the film by means of a prism.

The severe limitation of this system is its imaging of a TV monitor rather than extracting information directly from tape or data. It is of much the lowest quality, but is fast and cheap. It is not suitable for HD work.

Electron Beam Recorder / Film Recorder

The EBR was first developed in the 1970s. Inside a vacuum tube, an electron beam (as in a CRT) is scanned across the film frame. Since electrons cannot carry colour information, each video frame is exposed three times to three strips of B/W film, through RGB filters. The three exposed negatives are then step-printed together, again through RGB filters, to produce the colour negative.

The Film Recorder is a development of the EBR (though 'film recorder' can also be used as a generic term for all these processes) which, through the use of variable filters in the beam path, allows colour stock to be directly exposed.

This technology is now well advanced and competitive at the highest level. It may not deliver the absolute precision of laser recorders, but perhaps compensates by adding 'warmth' to the image. In addition, film of widely varying types and sizes can be exposed at a whole range of resolutions. The most widely used is manufactured by CELCO.

The exposure time per frame is approximately 5 seconds.

Laser Recorder

The most recent development is the laser recorder, adopted from the print industry, which scans an image onto the film frame using three RGB lasers. In the right hands these machines provide, perhaps, the most precise conversion from tape, though can be more expensive than some older film recorders. The only one currently being manufactured is the ARRI Laser, requiring, in the latest version, just over 3 seconds per frame. Certain labs though may still operate certain discontinued machines - the Kodak 'Cineon Lightning', Digital Cinema Systems 'Lux', or Pthalo Systems 'Verite'.

Transferring tape to film is a costly business. Previously this type of transfer was viable only for high-budget commercials and special effects work, but with higher throughputs, following the development of faster systems, costs have come down to the point where scanning entire features is a realistic option, even for lower-budget UK films.

It's important to state here that the term 'digital post' can be misleading. Not all digital post production facilities handle tape to film transfer – that requires a suitably equipped lab. It's also worth noting that not all facility houses or labs currently support HD work, which has either to be scanned to data or to an intermediate tape format. It's important when choosing a post production facility to understand exactly what kit is on offer and to what extent work will be farmed out to other facilities. Not only will this dictate the delivery requirements but it will determine the quality of the completed negative. The results from different labs vary considerably. For high end work it is the calibration, set-up, and operation of the tape to film transfer that count, not the particular choice of machine.

Digital Intermediate

The term 'digital intermediate' refers to a process whereby film is scanned to produce a 2K (2048 horizontal pixels) digital version, either as an uncompressed digital tape format such as D5 or as a data file, primarily to enable computer based colour correction. After the right look is achieved, the file or tape is then transferred back to film to produce a new negative (or internegative). In effect, it's an analogue-digital-analogue conversion.

A recent example of digital intermediate work is the Coen Brothers' *Oh Brother, Where Art Thou?* which used a Phillips Spirit DataCine to convert the original film to digital, so that the hue and saturation of colours could be adjusted with great finesse. In the case of *Oh Brother*, the process was used because the Mississippi locations were considered too green and lush. After initial tests, DoP Roger Deakins felt that conventional lab processes – bleach bypass and a B/W dupe combined with the colour negative – didn't offer enough control. He opted instead for a digital intermediate to obtain the burnt out yellow 'look' of the finished film. Though not entirely successful in every frame the result was undoubtedly impressive and effective.

So what's happening in Europe?

It's worth pointing out that, whilst *Oh Brother* gained a lot of press for this 'innovation', Danish labs - very much pioneers in all aspects of digital post - have been exploiting this tool for several years. In fact, all across Europe for the last few years, things have been getting lively in the tape to film business. Needless to say, facilities in the UK are lagging behind, but there are signs of improvement, with those previously dedicated to commercials and music video production beginning to venture into long-form transfers. Conventional film labs are also slowly beginning to respond to the growing demand for tape to film. One interesting development is the increasing alliance between production companies and post houses in the merging of content and process, creating a self-perpetuating association, hoping to lead to international player status.

In Germany, the establishment of the Neuer Markt has generated a period of investment for several companies. Notably, post production house Das Werk has merged with Road Movies and as a result have bought into TV production businesses, Traumwerk and FFP Media, Spanish post house En Efecto and has a majority stake in LA based Promark Entertainment. Similarly Cine Media, a post house part owned by Bavaria Film, has acquired US titles for Germany and has entered as co-producers with Taunus Film and Checkpoint Berlin to make 'low-budget' features.

Having invested in digital technology for over a decade, France's post production industry, largely dedicated to feature work, now appears to be overheated with intense competition driving down rates. Two companies, Duboi and Mikros Images have opted to concentrate on the growing number of features, particularly low-budget, effects-driven films. Both have established digital labs, Duboicolor and Cinem@ respectively, with links to other post facility houses.

Denmark, which in recent years has enjoyed success in the international film market, has well-established digital post and lab facilities, notably Hokus Bogus and DFL (Digital Film Lab), the latter recently opening London-based facilities. Linked with Soho Images in the UK, DFL has over the past four years pioneered, and concentrated upon, digital intermediate processes encouraging origination on 16mm and 3-perf 35mm combined with digital post as cost effective alternatives to acquisition on digital formats.

At time of writing, only one post house in the UK is fully HD equipped. This is London-based, HOME, who are targeting feature producers going down the digital post route and those companies working with HD mainly for the US TV market. HOME have a well established association with Hokus Bogus, the Copenhagen lab, who provide ARRI Laser film transfer facilities. In March 2001, Mill Film, the high-end post facility for commercials and CGI work, told us they were currently assessing their strategy for HD post. Also, the Computer Film Company another London-based company working mainly in commercials, is taking on more effects work for mainstream features. Kodak-owned Cinesite Europe is also said to be setting up its (as yet unnamed) UK all-digital lab. Like they've got anything to worry about...