POINT OF VIEW

The Future of Film and Tape—The Marriage of Two Media

By **BLAINE BAKER**

As I'm sure you are all aware, there are two basic media in extensive use today for image production and presentation — photographic film and videotape. While each of these media is based on a different principle, they are by no means mutually exclusive. For many years, material for television has been produced on motion picture film, and recently filmmakers have been drawing upon television technology to aid in film production. There has, in fact, been a long and close relationship between film and videotape, and there has been a long history of transferring from one medium to the other. Producers have found that film and tape can often interface quite well, and so these two media have formed a productive union over the years.

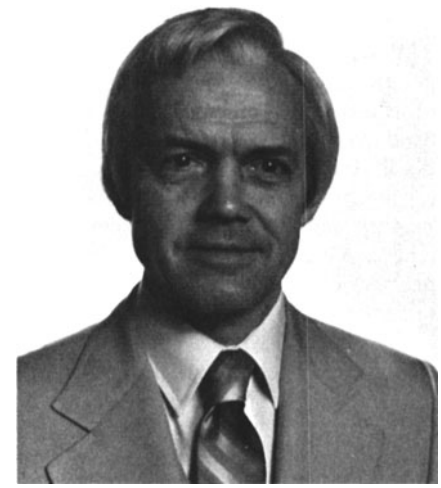
Our film laboratory has a history of videotape-to-film transfers, but before I delve into the problems we have been facing in recent years, let's take a retrospective look at the development of film-to-tape and tape-to-film transfers in order to better understand the situation as it stands today.

I speak to about five or six college film classes each year, and I usually preface my remarks by reminding students that, at one point in our industry's history, there was no such thing as videotape. These days it seems as if videotape has been with us forever, but for those of you who don't remember, there was a period in television's history when we had a lot of live programming, most of it emanating from New York and Chicago. One of the initial problems faced by broadcasters was how to supply service to western time zones. How could they take a top-rated show broadcast at 8:00 p.m. in New York and supply it to Los Angeles and San Francisco audiences without showing it at 5:00 in the afternoon?

The solution to this problem devised in the early days of television was kinescope recording; recording the broadcast image by using 16-mm film to photograph the face of a television monitor. The term "kinescope" was soon shortened to "kine," which became one of the first four-letter words in our industry. The quality of the kinescopic image was far from satisfactory, but it was the only method at that time for delaying live television programming for mass market audiences in other time zones.

With the coming of videotape in the 1950's, there was now a means of delaying live television programs by recording them on videotape. Before long, it became common practice to do away with the uncertainty of live programming by videotaping everything for broadcast, except, of course, for news programs and sporting events. Much of today's programming originates on videotape with a so-called "live" look to it.

Shortly after the advent of videotape, a number of forecasters were predicting the end of kinescope recording. After all, what possible use could there be for a television image preserved on 16-mm film when videotape could be used instead? What the forecasters did not consider were the millions of 16-mm projectors in use throughout the world, and the need for disseminating programming via film. What initially appeared to be the death knell for kinescope recording, actually generated more videotaped programming which would ultimately have to find its way onto 16-mm film.



Blaine Baker

At that time, as now, television technology consisted of a number of incompatible television systems, formats, and gauges. Film provided the common denominator between these formats. Whatever image was available on 16-mm could ultimately be distributed on any television format. Consequently, organizations involved in kinescopic recording were adding such enhancement devices as wobble generators, high-resolution tubes, and a variety of electronic black boxes.

From the days of the poor-quality "kine," there has been a steady advance in the technology of videotape-to-film transfer systems. Electron

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beam recording, for example, was developed in 1972. This method of transfer takes the electronic signal and separates it into its red, blue, and green segments, then each color signal is treated separately within the electronic system. Photographic exposure onto 16-mm film is done directly with an electronic beam, rather than by photographing a kinescope tube. After electronic separation, each of the primary colors is exposed to one frame of black-and-white film for each color. Therefore, this photographic process generates three times as many frames of information than would normally be used to create a video image. From the black-and-white masters, a color internegative is produced on an optical printer using a rotating color filter wheel. From this step onward, the process is very much like kinescope recording.

A third method currently being used to make videotape-to-film transfers uses laser technology. As with electron beam recording, the red, green, and blue color signals are separated and treated individually during the photographic process. The red, green, and blue portions of the signal are actually separately exposed on the 16-mm color negative film using lasers. An extremely high speed, rotating mirror prism is used in this process.

Program material transferred to film using kinescope, electron beam recording, or laser recording is acceptable for most applications. Of course, the resulting image cannot have the same resolution quality as a program which was shot, printed, and projected using film alone as the medium. Bear in mind, however, that we now have more than a generation of people who have grown up in front of the television set. Their eyes are accustomed to seeing an image of lower resolution and quality than the previous generations who grew up looking at film reproductions.

Among the many videotapes we receive daily for transfer to film, there are very few of top quality and many of them have electronic problems. Obviously, there is a double standard which exists; the difference between what is acceptable videotape reproduction and what is acceptable film reproduction. One of the most frequent questions we are asked is, "How much quality will I lose in the tape-to-film transfer process?" Of course, there is little or no image deterioration in the process of transferring from tape to film because of the high resolution qualities film has to offer. If viewed under the same conditions, a videotaped image shown on a 19-in (48.26 cm) monitor and a projected film transfer shown on a 19-in screen will look the same. Of course, one of the major reasons for transferring tapes to film is for display of information before a large audience on a 6-ft (1.8m) to 8-ft (2.4m) screen. Under these circumstances, the limitations inherent in the tape-to-film image transfer process tend to become blatantly apparent.

Advances have also been made in film-to-tape transfers. In the last three years it has become increasingly popular to shoot television programming in 16-mm or 35-mm negative film and then transfer the image directly to videotape for distribution. The instrument responsible for this trend is the Rank Cintel flying spot scanner, which was introduced three years ago. This device does not rely on the conventional pull-down claw, intermittent action projector for the reproduction of a film image as an electronic signal. Instead, a smoother, continuous flow mechanism transports the camera negative, and a flying spot, a cathode ray tube in reverse if you like, transforms the optical image into an electronic signal one line at a time. From this signal, the image can be transferred to any size or format of videotape for the sake of economy or quick editing.

With this kind of film-to-tape, tape-to-film transfer capability, an obvious question arises. Will producers use the convenience and economy of motion picture equipment for original production, transfer the image to videotape for the sake of economy and speed of electronic editing, then dub the videotape master back to film because of the universal appeal and availability of film projection equipment? To the dismay and chagrin of film purists, the answer will most probably be "Yes!"

What is the established film laboratory doing about the marriage of film and tape? They are making more and more trips to the bank, trying to acquire funds for new equipment to meet customer demands. In fact, the word "laboratory," which is used in conjunction with so many film facilities, may very well have to be changed to "duplicating house" or "post-production center." More and more, our facility and countless others are finding themselves confronted with the problems of interfacing between film and videotape. If you have been watching the production laboratories' advertisements and direct mail announcements, then you have probably noticed that many are acquiring additional video equipment, some for the first time. While no one is predicting the demise of tape or film as a distribution medium, many feel that the modern production facility will have to have the capability to deal with both, and that is an expensive change for the laboratory.

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For example, at our medium-sized laboratory in Memphis, we will invest more money in video equipment this year than we have in film equipment over the last several years. Our natural fear is that the equipment we invest in today may become obsolete before we can pay the bank loans for its initial purchase. Considerable pressure is

being placed on management to make the right decisions regarding equipment acquisitions. The lack of standardization within the video industry, and throughout the world, is equally frightening. Earlier this year, an executive involved in technical development for a major network made the following statement:

> What distresses me more than anything is that we'll be entering the 21st century with the finest technology but with the world's lowest quality television standards.

Sony also recently announced the development of a new video system using 1125 scanning lines. Should this system receive popularity within the industry, there could be overnight obsolescense of equipment now being used in production and laboratory operations.

In addition to videotape equipment being added to film facilities, there is also the new potential offered by videodisk. The battle is now under way between the three incompatible videodisk formats. Depending upon the acceptance of any given format within the marketplace, laboratories may have yet another medium to contend with, and another set of bills to pay.

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Additional services will have to be offered by film laboratories in the years to come. I also predict that there will be mergers of one type or another between existing film laboratories and video post-production facilities. Both television post-production houses and film laboratories are dealing with a medium of visual communication, and the need for a diverse mixture of services is growing.

With regard to the marriage between videotape and film, the bond is strong and growing stronger. Because of the lack of a universal television standard, there will be a continued need for tape-to-film transfers. In many cases, the only economical means of showing a given program to a foreign audience is by providing that program on 16-mm film, which is a universal and well-established standard. At the same time, the advent of high-definition television and digital technology is improving the quality of the television image, and by implication the potential quality of the image produced by tape-to-film transfers.

These trends speak well for the advantages of the SMPTE membership. Where else can you share in the technology of both film and videotape as well as you can in the Society of Motion Picture and Television Engineers?

There is no battle between the applications for film and tape. These two media coexist quite peacefully, each having its separate and important function within visual communications. And both will continue to exist for years to come.

Letter from the President

Because of the ever-increasing pace of both technical and social change in the world today, it has become obvious that if the SMPTE is to remain a leading technical society, a long-range plan for growth and activities should be developed and reviewed periodically. To this end, an ad hoc committee has been formed to assess our present sphere of activity and to draft a long-range plan. I ask your help in supplying ideas and guidance to the committee that will be meeting for the first time in conjunction with the Television Conference in Nashville on February 5 and 6, 1982. Typical questions might be: Is the Society's engineering program engaged in activities that are really outside our area of interest or are there areas where it should be operating and is not? How can the *JOURNAL* be improved? Is the technical level correct? And if not, what should it be? What should be the extent of our relations with international societies and standardization programs? These are only sample questions to stimulate your thinking. I urge you to give serious thought to how you feel the Society should develop in the years ahead in order to provide a high level of technical leadership in our chosen fields. Please send your suggestions to me at the following address: Charles E. Anderson, MS3-46, Ampex Corp., 401 Broadway, Redwood City, CA 94063.

Charles E. Anderson
SMPTE President