TRADE-OFFS IN CABLECASTING

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When one is attempting to decide upon what type of closed circuit television system to install, he comes to many forks in the road. "Should I go to color or black and white?" "Should my equipment be mobile or permanent?" "Should I use a 16mm film camera or a video camera on remote programs?" Most times these questions are asked in search of trade-offs which can be made when faced with problems of both capital and operating budget.

If there were no money or manpower limitations you would have enough equipment and personnel to go either way depending only on the dictates of program requirements.

This paper has been prepared to analyze two of the most common, but most difficult trade-off decisions which occur in our industry. The first is "color vs. black and white," and the second is "permanent vs. mobile studio equipment."

Color vs. Monochrome.

Other things being equal, a color television picture is far more stimulating than black and white. For this point there is no contest. But even in the face of this logic, and acknowledging the growing proportion of color home TV receivers, black and white cameras will, for the foreseeable future, still be the recommended method of televising a significant amount of locally originated cable programs.

This should not be construed as a negative attitude toward color equipment by TeleMation or me, for TeleMation has literally pioneered color television for cablecasting with eighteen studios either installed or in the process of being installed in cable systems. The point is that if you decide to rely solely on color, you will have to trade-off some types of programs which are done best, or only, in locations away from the studio.

Low cost vidicon color cameras reproduce color accurately only under controlled lighting of relatively high intensity. This type of lighting is not always available in the typical cablecasting schedule. It is not likely, for example, that the city council will consent to work under the amount of lights required to make a technically good color picture. Without these lights, pictures will tend to be off-color, ghosty, and noisy. The same electronic problem occurs in many evening sports events and social functions.

Another problem with color cameras is the large amount of paraphenalia needed to drag into the field if a smooth two camera production is to be accomplished. Color cablecasting is simply more complicated, and requires more technical skill than monochrome work. The weight and bulk of video control equipment is greater; and the amount of AC power available in many buildings is not adequate for portable lighting.

If for no other reasons than the relative simplicity and lower cost of equipment and operation, black and white productions will remain a large part of the cablecasting scene.

It is my opinion that, in general for most communities, Mrs. Jones will give up color for black and white if it is the only way she will be able to see her Bobby on TV crunched at the goal line on Friday evening.

It must be remembered, however, that it takes a fairly sophisticated black and white camera to do these marginal light productions. The pick-up tube must be at least of the separate mesh vidicon variety, and preferably a Plumbicon* (or lead oxide) or image orticon type. Separate mesh vidicon viewfinder cameras range from $1,000 to $2,000 each; Plumbicon* or lead oxide tube cameras are about $3,000, and image orthicons begin at $5,000.

Because of the growing number of low cost color cablecasting studio starts, it must mean that the trade-off in program types is considered an acceptable price to pay by some operators. For example,

Tony Acone is a professional CATV program director for Coachella Valley TV in Palm Desert, California who has insisted on beginning cablecasting operations with a complete color studio system. Tony says: "In our resort and professional type of market area, people are extremely color minded. Color TV sets are the rule rather than the exception; and imported and local TV stations are color.

"Our only cablecasting limitation so far has been basketball and night football. Even with two full console bays of equipment, we take our color cameras from the studio into the field. Everything is carefully planned so that remotes are not unreasonably difficult. For example, tomorrow we will do the school dedication at 9:30 a.m., the high school baseball game at 3:00, and we will be ready for our evening show in the studio at 7:30. Slightly over 30% of our shows are in the field -- all in color."

Other cable operators avoid the program trade-off problem by having a simple, mobile monochrome system to supplement the color production center in the studio.

One multi-system operator is placing a sophisticated broadcast type, two-camera Plumbicon* color mobile van within a designated region to circulate through nearly a dozen owned cable systems. Special color programs can be staged in these communities in or out of the studio. A technically trained crew can operate efficiently on an annual basis with programs planned ahead of time. Advertising can be sold in advance of the productions which will be of a quality and nature to pull even the most jaded local businessman into the picture.

Each of the local cable systems, in this case, have their own, more modest monochrome systems for daily programming in black and white.

Because of the specific advantages of color, monochrome systems should be purchased with future convertability to color in mind. This is especially true for switchers, sync generators, film multiplexing systems, and videotape recorders. The monochrome cameras should be rugged enough to live out this evolution, so that they can be used for those "remotes" when color finally arrives in the more modest studio.

The future is likely to see the Plumbicon* (or lead oxide) type of pick-up tube used in color cameras at prices not too far different than that for existing vidicon versions. One color camera operates at extremely low light levels but costs four times more than existing low cost cameras. These types of cameras will solve some of the low light problems, but will still require more production skill and equipment logistics than black and white.

Permanent vs. Mobile Cablecasting Equipment.

The degree to which closed circuit television equipment is portable must be measured in three ways: (1) cameras, (2) the video and audio control center, and (3) videotape recorders.

A simplified definition of a permanent studio facility is one in which the control room facilities for camera and audio switching are not movable from the control room for producing programs outside of the studio.

Let us assume that you have a cablecasting system with two studio viewfinder cameras, a film chain, two videotape recorders, a MESSAGE CHANNEL™ and a WEATHER CHANNEL™. Your control equipment must provide a program switcher with capacity for at least six and preferably eight to twelve inputs. The extra inputs are for expansion of additional video inputs, such as special-set cameras, special effects, character generator, etc.

The control room will also need an adequate number of monitors -- at least four: a waveform monitor; a common synchronizing generator driving most, if not all, cameras; an intercom system between the technical director operating the switcher and the cameramen. It is also desirable to have remote controls placed in the control console to set up cameras and operate projectors and video recorders.

This much control equipment usually requires two consoles (three, if color) mounted together requiring floor space of approximately 4' by 4', and weighing approximately 450 to 500 pounds. A certain part of the capacity of each major equipment component in the console would be needed to produce a two camera show in the field, but to

take the console into the field would obviously shut down other programming in the studio, such as films and tapes; and the problem of moving this amount of equipment is substantial. Since remote cablecasting is extremely important, the problem of portability must be solved.

Typical solutions to this problem are as follows:

(1) Rely upon single camera productions in the field without need for switching. Or

(2) Place all equipment in a van which becomes the control room, and which is connected to the studio by video, audio, film and VTR remote control, and power cables. Or

(3) Reduce video and audio control equipment to that which can be housed in one or two portable cases, and supplement it with a "bare-bones" standby switching monitoring system to be used when the portable console is taken into the field. Or

(4) Develop dual control facilities where the complete studio control room console is left in tact, and a separate, more modest mobile control unit is always available for use outside the studio. This mobile control unit can either be fixed in a van, or mounted in a portable case for use in or out of the van. The dual system is the best solution technically, but, of course, it is the most expensive in capital investment. Measuring portal to portal program time and costs, it may not be the most expensive to operate.

Single Camera Operation.

The obvious advantage of the single camera system connected directly to a videotape recorder is maximum simplicity of operation and transportation. The camera should have the following features to fully capitalize upon this technique:

(1) The camera should have an internal synchronizing generator which can be switched on when separated from the common sync system of the studio. Sync should be of the same quality as the studio system, preferably EIA or quasi EIA standard.

(2) The camera should have a lens which has a wide range of zoom focus, preferably 15mm to 150mm. Distances between camera and subject will vary more widely in the field than in the studio--especially with only one camera.

(3) The camera should have a pick-up tube which has superior low light performance, since studio lighting will not always be present

The Mobile Van.

To maintain that multi-camera "broadcast" operating format in the field, a mobile van is the most effective equipment mode. It permits a complete console arrangement; and wear and tear on equipment from moving it between studio and field is minimized by its permanent mounting in the van.

There are trade-offs in production methods which should be recognized, however, when the van is used as a control room for both studio and field. Let's look at some of these.

Film projection equipment is rarely, if ever, needed in the field. The optics of film chains are so critical that performance is enhanced if the system is securely mounted to a concrete or similar footing. A complete 3-way optical multiplexer with 2 16mm projectors and 1 slide projector is virtually impossible to fit into a van.

The film chain and at least one videotape recorder should be left in the studio when the van is away on location, so that continuous program capability is available.

The problem of splitting up your program production equipment between the control console in the van -- and the film equipment in the studio -- will occasionally cause problems for one man if he is running films with live programming.

Since the control room operator has no way to observe the studio set except by the two camera monitors placed in front of him in the van, he has to rely on comeramen to have more skill in some programs, and camera shots may require more pre-planning.

I would suggest that your two videotape recorders be of the portable type instead of rack-mounted in this situation. You are going to have some down-time on recorders, and the studio and van recorders should be completely interchangable without remounting in racks.

Storage cabinets in the van should be built with form-fitting shock padding so that cameras can be transported with lenses and tripod head attached. This will permit set up and tear-down time and wear to be minimized between studio and field.

One problem which can come up when all control equipment is fixed in the van is using cameras in locations where the van cannot be conveniently parked. For example, public buildings where council chambers are located are often built so that cables for cameras, audio, and power have to be laid across sidewalks, up stairs, down halls, and in aisles. Athletic arenas or gymnasiums can present the same problems. This is where solution number three, the portable control case, is needed.

The PORTA-STUDIO™.

The PORTA-STUDIO™ -- or portable video and audio control case -- gives maximum mobility. The trade-off is usually in terms of less switching capacity, less sophisticated remote controls of cameras and audio sources, and abbreviated test and monitoring equipment.

The PORTA-STUDIO™ also requires a certain amount of "standby" switching and monitoring in the studio, so that film, videotape, and automatic programming can be carried on while programs are being produced in the field. Again, all videotape recorders must be portable.

The program audio mixing console should remain in the studio where all microphone, VTR, film, audio tape, turntable and other inputs remain permanently connected. The PORTA-STUDIO™ needs only a simple microphone mixer with say, four mic inputs and one line level input capacity.

Dual Facilities for Video Control.

Cable systems which can afford dual studio and mobile facilities are very likely to develop color for the studio and black and white for the field. The type of mobile black and white mobile system

which is developed -- van or PORTA-STUDIO™ -- will have to be determined by the effect of the trade-offs on your planned cablecasting schedule and quality requirements.

When planning your studio and remote cablecasting equipment, I hope that the trade-offs described in this paper will give you a helpful frame of reference for your investigations.

Thank you.

DISCUSSION

Mr. Ken Lawson: Thank you.

Mr. Greg Liptak: I think Ken has put down in a logical and organized fashion some of the problems that we're all dealing with on a day to day basis, particularly when you're talking about the capital investment required. We would all, I think, no matter the size of the system we're building, like to have a full color operation, but then we are in the position of are we going to have to forget about doing the local high school football and basketball games and some of these other things that really would be probably the major source of revenue for us at the start. I think it would be valuable at this point to hear from you as to your experiences with regard to color. We have in two of our systems, color cameras. They are low cost variety. We have a single camera in each system. At the start, I guess, we've had them in operation over 6 months now, we have determined exactly what Ken has told us---that we cannot use this low cost color camera in a remote situation under low light level conditions. It just doesn't work and yet we are able to provide beautiful studio pictures and under daylight conditions, excellent pictures. And it has, by the way, had a favorable marketing effect on the selling of advertising time on our local channels.

I would like to know what type of camera the fellow was using which he described in California?

Mr. Lawson: It was an IVC 3 tube camera.

Question: Was it a Plumbicon?

Mr. Lawson: No, it was a low cost Vidicon version. He's done a few things with it. He has put a 10 to 1 zoom lens on it which means he can go out and during the dedication of a building, for example, he can get off the sidelines and zoom in on the grandstand. (Tape fadeout)

Question: I was wondering--I was talking to someone from RCA yesterday on their color camera and they think if you take the color filter out of their camera which puts it into black and white. They think it will work very satisfactorily at low levels. Does anyone agree with this?

Answer: I would say there is no reason why it couldn't.

Mr. Liptak: We surely need a color camera that will operate under low light levels. If manufacturers could achieve that, our problems would be greatly lessened.

Question: Not audible.

Mr. Lawson: They claim it will work on monochrome with low light levels if you take the filter out of it and it's a matter of an hour's job to put it back in and realign the camera.

Mr. Liptak: That's part of the problem that we found--we really have to, in dealing with some of this equipment, have to have highly skilled people and that's why we like the particular variety of color camera that we're using because it's built like Collins Radio equipment--there's not too many buttons anybody can foul up. I would say there are two or three buttons you can do something with.

There is an equipment manufacturer at this show who supposedly has a low light level color camera and they say it will operate at 25 ft. candles.

Question: Of the three types of tubes optionally available for your cameras, could you give us a rundown how much light level is required and the difference between light levels?

Mr. Lawson: Just very generally because what is a good picture is different than what people think. Let's just forget about trying to produce a studio type of picture with backlighting and all the effects. We're going to talk about an electronically good picture--one that doesn't have too much noise in it and one that doesn't have too much smear in it. The 7735A type of Vidicon tube is the standard tube used most normally. To get a really good picture, you need 125 ft. candles. If you get down below 100 ft. candles, I think you begin to pick up noise and you begin to pick up a certain amount of lag and this would differ from camera to camera, but 75 ft. candles would sure be a cut-off, I would think, in terms of doing a presentable thing subject to a standard Vidicon tube. An A541 down to that point has very little change in lag at all in noise. I wouldn't worry about ft. candles at all, but if you got down to 50 ft. candles, I think you might begin to lose a little bit. Remember again, this also depends on the type of lens you have. Let's assume

you have a normal 10.1 production zoom lens, you probably can get down to 35 ft. candles with a Plumicon tube and still have an acceptable picture electronic-wise. You may not have all the detail you want. See a 10.1 zoom lens has an F stop of about 2.8. This is the very important limiting factor on what's going into that tube. (Tape fadeout)