

## **The Cost of Getting it into the Can** by Glenn Estersohn

Why shoot digital? Producers and directors are discovering persuasive reasons, including new creative options, better suitability for digital effects, greater fluidity in shooting and instant "dailies." But sometimes, the bottom line is the bottom line. Time and again, it can all come down to cost.

In a perfect world, shooting digital can save money in three important ways.

1. Lower costs for camera rental, shooting stock and processing.
2. Fewer shooting days.
3. Lower postproduction costs.

But as we'll see, the real world isn't perfect. And the savings are often "spent" in other ways.

Of course, trading off cost against other considerations is nothing new. 16mm, Super 16mm and 35mm film have always offered the producer a hierarchy of quality versus cost. The ultimate choice has largely been made on the basis of aesthetic aspirations versus budget limitations. Digital and film formats are so fundamentally different that head-to-head comparisons can be misleading. But in practice, producers are coming to consider specific digital formats as potential alternatives to specific film formats. This makes for a rough equivalence. In that vein, we can look at the hierarchy of film formats, lining them up against the digital formats that typically end up in contention.

### **The Digital Corollary of 16mm**

For example, 16mm film clearly contends with DV-based 4:1:1 digital formats. DV, Sony DVCAM and Panasonic DVCPRO 25 all share a few common technical attributes. To squeeze all that digital information onto quarter-inch tape, all these formats use digital subsampling and 5:1 compression. Together, these techniques reduce the number of bits to be recorded by 85%. And to minimize the real estate for each recorded bit, these formats use metal tape technology. Consumer DV and professional DVCAM digital videocassettes both use Advanced Metal Evaporated (AME) tape, while DVCPRO uses metal particle tape. The result is 40 or more minutes of digital acquisition on a tape you can slip into a shirt pocket—with room to spare.

Some back-of-the-envelope cost comparisons (see charts) make at least two digital advantages clear. Based on street prices in New York, DVCAM tape with IC Memory is 97% less expensive than 16mm stock, developing and dailies. And tape without IC memory is less expensive still. In other words, digital practically eliminates stock and

developing costs. While precise head-to-head comparisons are difficult to define, the cost of DVCAM camera rentals runs roughly 60 to 80% less than 16mm rentals.

	<b>16mm</b>	<b>DVCAM</b>
<b>Stock</b>	<b>Eastman 7293 EXR 200T</b>	<b>Sony PDVM-40MEM with IC Memory</b>
Feet	400	233
Minutes	11.11	40
Cost	\$126.56	\$24.95
<b>Stock Cost/Minute</b>	<b>\$11.39</b>	<b>\$0.62</b>
Developing/foot	\$0.14	\$0.00
<b>Developing/Minute</b>	<b>\$5.04</b>	<b>\$0.00</b>
Video Dailies/foot	\$0.15	\$0.00
<b>Video Dailies/Minute</b>	<b>\$5.40</b>	<b>\$0.00</b>
<b>Total Cost/Minute</b>	<b>\$21.83</b>	<b>\$0.62</b>
<b>Digital Savings</b>		<b>97%</b>

*Considering stock, processing and dailies alone, DVCAM tape is 97% less expensive than 16mm film. Sources for this and the following media price comparisons: for film stock, Kodak New York sales office (212) 631-3400; for tape stock: B&H Photo, New York, (single unit price), [www02.bhphotovideo.com](http://www02.bhphotovideo.com); for film developing and dailies: DuArt Film and Video, New York (212) 757-4580.*

	<b>16mm</b>	<b>DVCAM handheld</b>	<b>DVCAM high end</b>
<b>Camera Rental, average of prices in New York, Chicago, Los Angeles</b>	<b>Aaton XTRProd, Arriflex 16SR-3 or Panaflex 16</b>	<b>Sony DSR-PD150 or DCR-VX1000E</b> (Note: Cameras accept Mini cassettes only; maximum record time 40 min. in DVCAM mode or 60 min. in DV mode.)	<b>Sony DSR-500WS</b> (Note: Camera accepts both Mini and Standard cassettes.)
Rate Card daily rental, including batteries, charger, AC power, lenses, tripod, fluid head and (for film cameras) color video assist.	<b>\$1,310</b>	<b>\$305</b>	<b>\$533</b>
<b>Digital Savings</b>		<b>77%</b>	<b>59%</b>

*The savings in camera rentals are almost as dramatic. Note that camera rental prices vary greatly from city to city and between the published rate card and the "going" price. Variations in lens assortments and accessories can also make head-to-head*

*comparisons tricky. Sources here and below include Abel Cine Tech and LVR (New York), Fletcher Chicago and Clairmont Cameras (Chicago), Panavision and Plus 8 Video (Woodland Hills, Hollywood and Los Angeles).*

No wonder the DV-based formats have been a slam dunk for a growing list of independent productions, documentaries and short subjects, in addition to such theatrical features as *The Anniversary Party* (DVCAM), *Time Code* (DVCAM), *Original Kings of Comedy* (DVCAM and DV) and *Bamboozled* (DV and 16mm).

According to *Bamboozled* director of photography, Ellen Kuras, ASC, the choice of DV was dictated by director Spike Lee's desire to shoot affordably and quickly, covering each take from multiple angles. "We used up to fifteen simultaneous cameras for the performance scenes," says Ellen Kuras. Of these, the eleven were DV and four were 16mm film. "In other scenes, we would put a camera on the ceiling, or two Sony Handycams on a conference table, back-to-back." Many of these unconventional shots made it into the final cut, contributing to the unique look of the movie. Here an innovative but expensive shooting technique was made affordable by the cost savings of digital media.

Cinematographer John Bailey, ASC has shot more than 40 feature films, including *American Gigolo*, *Ordinary People* and *As Good as It Gets*. He shot *The Anniversary Party* for Jennifer Jason Leigh and Alan Cumming in DVCAM using the Sony DSR-500WS. Says Bailey, "Despite an 'A list' cast, we had a limited budget and an extremely short shooting schedule. Because much of the cast were personal friends, Jennifer and Alan thought that a video shoot would create a more informal atmosphere—like a high class 'home movie.' That's why we chose DVCAM."

### **Corresponding to Super 16mm**

The next step up in quality, Super 16mm is roughly paralleled by such higher-quality Standard Definition (SD) 4:2:2 digital formats as Sony's Digital Betacam, JVC's D-9 and Panasonic's DVCPRO 50. Also in contention is Panasonic DVCPRO 720P. Compared to the earlier set of DV variants, the 4:2:2 Standard Definition formats feature higher recorder bitrates and increased color resolution with little or no digital pre-filtering and milder compression. The four formats also present a mix of quarter-inch tape (DVCPRO 50 and DVCPRO 720P) and half-inch tape (Digital Betacam and D-9).

While the quality of these digital formats is technically higher than our DVCAM example above, the stock cost for shooting on Digital Betacam is comparable. As a result, Digital Betacam is also about 97% less expensive than Super 16mm stock, developing and dailies. Once again, digital all but eliminates these costs.

Digital Betacam camera rentals are also less expensive than Super 16mm, but by a narrower margin—about 26%.

	<b>Super 16mm</b>	<b>Digital Betacam</b>
<b>Stock</b>	<b>Eastman 7293 EXR 200T</b>	<b>Sony BCT-D40</b>
Feet	400	791
Minutes	11.11	40
Cost	\$126.56	\$27.99
<b>Stock Cost/Minute</b>	<b>\$11.39</b>	<b>\$0.70</b>
Developing/foot	\$0.14	\$0.00
<b>Developing/Minute</b>	<b>\$5.04</b>	<b>\$0.00</b>
Video Dailies/foot	\$0.18	\$0.00
<b>Video Dailies/Minute</b>	<b>\$6.48</b>	<b>\$0.00</b>
<b>Total Cost/Minute</b>	<b>\$22.91</b>	<b>\$0.70</b>
<b>Digital Savings</b>		<b>97%</b>

*The media formats are different but the result is the same.  
Digital Betacam media is about 97% less expensive than Super  
16mm.*

	<b>Super 16mm</b>	<b>Digital Betacam</b>
<b>Camera Rental, average of prices in New York, Chicago, Los Angeles</b>	<b>Aaton XTRProd, Arriflex 16SR-3 or Panaflex 16</b>	<b>Sony DVW-700WS</b>
Rate Card daily rental, including batteries, charger, AC power, lenses, tripod, fluid head and (for film cameras) color video assist.	<b>\$1,310</b>	<b>\$967</b>
<b>Digital Savings</b>		<b>26%</b>

*While the prices are closer, there's still a 26% cost advantage  
renting Digital Betacam versus Super 16mm.*

From productions like *Warm Blooded Killers* to *Buena Vista Social Club*, Digital Betacam has become another tool in the DP's kit.

### **The Digital Doppelganger of 35mm**

With its full 1920 x 1080 CCD sampling combined with progressive scanning at the film rate of 24 fps, Sony HDCAM 24P stands alone as the point of comparison for 35mm film. It was after shooting *Star Wars: Episode 2* on Panavision prepared Sony 24P cameras that George Lucas declared he would "probably never shoot another film on film."

	35mm	HDCAM 24P
<b>Stock</b>	<b>Eastman 5293 EXR 200T</b>	<b>Sony BCT-40HD</b>
Feet	400	791
Minutes	4.45	50
Cost	\$220.20	\$79.95
<b>Stock Cost/Minute</b>	<b>\$49.48</b>	<b>\$1.60</b>
Developing/foot	\$0.14	\$0.00
<b>Developing/Minute</b>	<b>\$12.58</b>	<b>\$0.00</b>
Video Dailies/foot	\$0.09	\$0.00
<b>Video Dailies/Minute</b>	<b>\$8.09</b>	<b>\$0.00</b>
<b>Total Cost/Min</b>	<b>\$70.16</b>	<b>\$1.60</b>
<b>Digital Savings</b>		<b>98%</b>

*At the top of the heap, HDCAM 24P media is about 98% less expensive than 35 mm.*

	35mm	HDCAM 24P
<b>Camera Rental, average of prices in New York, Chicago, Los Angeles</b>	<b>Aaton 35-3, Arriflex 535B or Golden Panaflex GII</b>	<b>Sony HDW-F900</b>
Rate Card daily rental, including batteries, charger, AC power, lenses, tripod, fluid head and (for film cameras) color video assist.	<b>\$1,958</b>	<b>\$2,154</b>
<b>Analog Savings</b>	<b>9%</b>	

*The rental price of the 24P camera is close to that of 35mm film cameras, depending on the specific packages you compare. On average, film has a 9% price advantage.*

While the captured image quality for HDCAM 24P is significantly ahead of our previous contenders, the economics for media are essentially the same. The cost for stock, developing and dailies is cut this time by about 98%.

In camera rentals, however, the HDCAM 24P runs neck and neck with 35mm film, depending on which specific packages are being compared. On average, 35mm film cameras cost 9% less to rent.

In addition to effects-driven science fiction productions, the HDCAM 24P system is beginning to find its way into the indie scene and some mainstream theatrical features.

Alexandria, VA postproduction facility Roland House specializes in high def post and also invests in indie productions. CEO Fritz Roland declares, "High Definition will make low budget filmmaking a reality. It will really open some doors. For high budget features, it's completely academic. But at less than \$50 million, you'll begin to gain a great deal."

For writer-director Rodrigo Garcia, the Sony/Panavision 24P camera was an easy choice. "I had a total budget of \$100,000 for *Ten Tiny Love Stories*," a production for the Independent Film Channel, intended for theatrical release.

Steven Douglas Smith was the first director of photography to complete a feature, *Nicolas*, with the Sony/Panavision 24P camera. He has since used the camera to shoot two more: *Swimming Upstream* and an effects-driven action-adventure, *Coronado*. He says that the lower media costs of digital were crucial to the first two movies. And he estimates that the *Coronado* production saved \$1 million on potential film processing and scanning fees by shooting in 24P.

In contrast, budget was no concern at all when director of photography Emmanuel Lubezki selected the Sony/Panavision camera for nighttime scenes in *Ali*. Michael Mann directed the movie, which stars Will Smith as Muhammad Ali and is scheduled for October release. "We went location scouting at night with a still camera and a DV camcorder. I noticed that the DV camcorder could get a terrific look at night, with amazing detail in the shadows. We tested the Sony/Panavision camera with the shutter disabled, the lens wide open and +3, +6 and +12 dB gain. You're not supposed to shoot like this. But we got a wonderful look with great detail."

### Longer Loads

One of the most important advantages of shooting digital may also be one of most mundane. Tape cassettes hold more than three times as many minutes as film canisters. For example, an \$80 HDCAM small cassette can roll uninterrupted for 50 minutes (24P mode). Compare this with eleven minutes for a 1000-foot reel of 35mm film.

Formats	Film Load	Tape Load (small cassette)	Digital Advantage
16 mm and DVCAM	11.11 min. at 400'	40 min.	3.6 to 1
Super 16 mm and Digital Betacam	11.11 min. at 400'	40 min.	3.6 to 1
35 mm and HDCAM 24P	11.11 min. at 1000'	50 min.	4.5 to 1

The difference was crucial for writer-director Garcia. "The movie is ten uninterrupted monologues by ten different women," he says. "The longest is 15 minutes straight. I suppose I could have done it in film, with custom equipment. Doing it in 24P was easy."

## **Letting it Roll**

The combination of 97% savings on recording media and longer loads can transform the flow of work on the set. Instead of stopping the camera and restarting for every take, directors are choosing to let the cameras roll. This single change can make a huge difference for actors, crew, director and producer alike.

Cinematographer Steven Douglas Smith says, "You can get more out of your actors while they're in the moment. I've had directors do three or four takes in a row, sometimes giving the actors direction between takes. For the independent filmmaker, that's a real luxury."

Roy Wagner, ASC has used HDCAM 24P equipment to shoot the pilot for Fox TV series *Pasadena*, directed by Diane Keaton. He says that letting the camera run, "gave the actors their environment. By not stopping every eleven minutes, it was their space. In the first years of sound, the sound technologists controlled the set until the directors rebelled. Now I think the film camera controls the set. But 24P lets you keep the tape running, keep the actors in their environment"

Independent writer-director Rob Nilsson, whose actors include members of the San Francisco homeless community, is enthusiastic about the running time of DVCAM. "I shoot long takes," he says. "I don't do the classic wide shot, medium shot and closeup. DVCAM enables my camera guy to move as one of the players."

Long loads and inexpensive media have a special advantage for aerial shoots, underwater shoots, ultra-remote locations, wildlife and natural history. For example, wildlife shoots generally entail hours of patient waiting and costly rolling of recording media. Here the long digital record time can make the difference between capturing an elusive event and losing it during a film magazine change. Digital media also transforms the economics of extracting minutes of dramatic and treasured images from countless hours of necessary capture.

## **Digital Doesn't Mean "Don't Bother Lighting."**

While digital cinematography does enable "run-and-gun" filmmaking, cinematographers dismiss the idea that in most productions, you'll simply shoulder the camera and shoot. According to Fritz Roland, "Each shoot is deeply, deeply affected by the culture. For the big-budget film culture, with all the lighting and dollies, nothing less than a 100-man crew will do."

That's certainly the case for producer-director Pierre de Lespinois. He has shot over \$60 million in TV production on Sony HDCAM, including *The Secret Adventures of Jules Verne*, *When Dinosaurs Roamed America* and *Inside the Space Station*. "I don't do anything different for HD," de Lespinois states. "There's no new magic. The only thing different on my set is the part that holds up the lens."

Steven Douglas Smith agrees. "At first it probably took me more time to light for 24P, because I was just gaining experience. High Definition tends to reveal what film grain hides, including skin pores and nose hairs. And if you want any sort of aesthetic, lighting will always take time."

Shooting on DVCAM for *The Anniversary Party*, John Bailey faced special challenges. "Because the story is about movie actors at home, we were going for film quality and a certain look of luxury. This meant some extra time in lighting. The DSR-500WS has an exposure index of about 250 to 320 ASA. But you also need to take into account the different parameters of video. For example, you can see into the shadows more, so you may need to take away light. And once the highlights hit 100 IREs, there's nothing left."

Even some productions using DV are being carefully lit. Allen Daviau, ASC was director of photography on such movies as *ET*, *Bugsy* and *The Empire of the Sun*. He used the Sony DCR-VX1000E to shoot the acclaimed short subject *Sweet* for fledgling director Elyse Couvillion. "While we didn't have a generator, we did use three lights," he reports. "To get the look, we controlled the light." Daviau was indeed successful, as the standing ovation he received at Sundance last January attests.

### **The Need for Speed**

Digital enables you to reduce your shooting ratios. Or digital means higher ratios. Digital lets you shoot faster. Or digital is just the same. It all depends on the creative demands of the director and cinematographer. Digital enables a pervasive rethinking of life on the set, but only if that's what you want. For example, seeing the instant playback obviates the need to wait 24 hours to see dailies, enabling you to strike sets faster (which may be more important to some shooting schedules than others). But ultimately the speed you achieve in digital production depends on you.

De Lespinois says that shooting on HD enables him to move much faster. "It costs me \$25,000 an hour to shoot," he says. "Every shoot swings between moments of intense concentration when the director says 'Action' and moments of relaxation when the director says 'Cut.' By shooting on digital, I can keep everyone focused and work much faster. Generally, you don't strike the set until you know you really have it on film. With HD, I always know exactly what I'm getting. I was able to shoot in Patagonia and walk away knowing I had everything."

But Steven Douglas Smith has a different perspective. "How fast you work all depends on the overall budget of your picture. It depends on the project you're doing. Each film has its own pace, depending on what you're trying to get out of the imaging."

### **Disquiet on the Set?**

To some, the prospect of having a high-resolution monitor on the set looks like an opportunity to arrive at consensus faster. To others, it looks like an invitation to disaster, inviting directors and producers to second-guess the DP to death.

John Bailey, cinematographer of *The Anniversary Party* says, "I've been on film shoots where the debilitating overuse of the video monitor stalls the creative flow. But I still like having a high-resolution monitor on the set."

"I keep monitors around the set so that every department can benefit," says de Lespinois. "Lighting, makeup, hair and wardrobe can all see what we're getting and make it better. It's 'what you see is what you get,' which enables us to push things farther."

Cinematographer Allen Daviau says, "You don't light by the monitor. You light by pre-visualization. Having a high resolution monitor on the set is not threatening."

Digital cameras also present the DP with a new range of refinements that cannot be done in the film camera. These include image enhancement, skin tone detail, digital soft focus, colorimetry and transfer characteristic. But opinions differ as to the benefits of making the tweaks.

According to Roy Wagner, "In a way, 24P is more dangerous because you have the opportunity to 'paint' every image with the camera control unit. Too often, you're tempted to invest too heavily in specific imagery with no room to play in post. I studied under Ansel Adams and he said that the image is created in the darkroom. I think DPs should concentrate on making a good, solid image for post. Then you can do the radical things in the 'digital darkroom.'"

### **Some Things Never Change**

As a growing number of established film cinematographers complete their first projects in digital, fears are subsiding that digital negates a lifetime of hard-earned expertise shooting film. Lighting is still lighting. Lenses are lenses. Shot design and composition haven't changed.

Allen Daviau, a five-time Academy Award nominee says, "The people who say film is dead are wrong and so are the people who say digital is evil. This has been coming a long time. I have a book entitled *Electronic Motion Pictures*. It was published in 1955."

Lubezki concurs. "It's a tool that should live parallel to film. The two are completely different media."

And Steven Douglas Smith adds, "It's another tool. I'll be shooting film as long as it's available. But I've got to be aware of digital."

By maintaining the long-treasured 24-frames per second capture rate, digital 24P complements 35mm film with expedited transfer between the two media. This will continue to broaden creative choices, making it easy for productions like *Ali* to choose both media.

## **Postproduction**

The cost advantages, if any, of digital postproduction depend largely on what you need to do and where you need to go. For example, if the production includes heavy effects sequences, if you're performing a digital online edit or considering digital release formats, then the savings tilt toward digital.

Digital can also mean lower color correction time and costs—especially if different film stocks would have been required in the same shoot. Many productions shoot slow and fast stocks for daylight and nighttime, for example, which then need to be matched in postproduction. Some high-end digital cameras have built-in high-speed and slow-speed capabilities. For example, the Sony HDW-F900 digital 24P camcorder can range from 150 ASA to 1200 ASA with low "grain" (electronic noise).

"So-called 'color correction' is really a misnomer," says Fritz Roland of Roland House. "Often what's done in the field is much cheaper to do in digital post." He says a talented operator can turn day into night, achieve "magic hour," gel hot windows, cool an overexposed sky, add or remove diffusion and even add or remove light in selective parts of the picture.

If a digital production is intended for digital release or digital broadcasting, the savings can be substantial. However, as *Sweet DP* Allen Daviau says, "There's a worldwide network of 35mm film projectors that will take a long, long time to change." So you may need to balance potential digital savings against the need to blow up digital productions for theatrical release on film—a process that alone can cost for example, \$500 per minute (Arri laser recorder; silent, timed print).

In the experience of Ellen Kuras, who shot *Bamboozled*, using DV required added care and expense in the digital-to-film process. And John Bailey adds that *The Anniversary Party* was restricted to relatively exotic (for Los Angeles) PAL-format postproduction equipment. The project also required more than the usual color correction after the transfer to film.

## **Cash Flow Capers**

For independent filmmakers, perhaps the biggest economic advantage to digital is not how much productions cost but rather when those costs are incurred. By nearly eliminating a big upfront cost, digital helps producers manage their cash flow. You can shoot digital, edit digital and project the edited digital master when you shop the feature around to potential distributors. Only after you secure a distributor do you need to spend the money for transfer to 35mm film.

## **The Bottom Line**

Shooting with digital cinematography doesn't reinvent the cost structure of filmed entertainment. You still need actors, sets, lighting and crew. You still must house and

feed them on location. However, digital does eliminate 97% (or more) of the cost of film stock, developing and dailies. And digital can lower camera rental costs. Different producers are putting these savings to use in two significant ways.

- **To lower the overall cost of production** as producers specifically sought with *Warm Blooded Killers*, *Sweet, Ten Tiny Love Stories*, *Nicolas* and *Swimming Upstream*.
- **To get more coverage** as in the multi-camera techniques that Spike Lee and Ellen Kuras used to create *Bamboozled*, or to achieve a new intimacy with the talent (permitted by smaller, more mobile cameras and longer recording times).

In addition, producers are seizing on digital as the ideal acquisition medium for digital effects-heavy productions, such as *When Dinosaurs Roamed America* and *Star Wars: Episode II*. And finally, even big-budget productions such as Michael Mann's *Ali* are turning to digital for creative possibilities not easily available with film.

After 100 years of film, creativity and cost remain in contention on almost every production. Still an infant technology, digital cinematography is already proving a powerful tool in managing this creativity/cost tradeoff. The future promises even more attractive performance as cinematographers, directors and technologists continue to nurture the digital infant.

SIDEBAR:

### **A Little Extra Help**

All digital production can save you money versus film. However, some digital media can save you even more. Sony Media & Application Solutions is offering two programs that can help protect the pocketbook.

#### **HDCAM First-Time Buyers**

Sony has periodically offered tape incentives to new camcorder owners. But this time there's a twist. Through September 30, 2001, Sony is offering ten percent off tape purchases not only to new owners of HDCAM camcorders, but also to first-time renters. So a broader range of independent producers can take advantage.

#### **Rewarding Recording**

Sony's Rewarding Recording program allows 2.5% of the purchase price of select professional and data media products be put toward Rewarding Recording dollars. These dollars can then be redeemed for reimbursement of Sony Professional VTRs and Camcorders, parts, service, purchase of Sony Consumer Electronics items and other benefits. The program has become extremely popular because it can effectively lower the cost of the investment in some Sony products you'd be buying anyway.

For more information about this program, visit [www.sonyrewardingrecording.com](http://www.sonyrewardingrecording.com).

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Writer Glenn Estersohn follows digital cinema, digital television and digital audio from his home in Scarsdale, New York.