

Under Water Video: Where We've Been and Where We Are Now! Or Why Switch to High Definition?

By Steve Douglas

Back in the 1980's the very first camcorders priced for the average consumer hit the market. These camcorders were the best anyone had seen since Grandpa's old 16mm movie cameras with its sped up pictures, no sound and Keystone Cops movement. However, these VHS camcorders were a bit clumsy to deal with when underwater. They had to have a separate housing for the recorder and another housing for the camcorder. Thus, it was quite the breakthrough to be treated to the high-end quality that was 8mm. Chuck Nicklin had one, a Minolta camcorder in an Aqua Video housing. It was the first I had personally seen. He had sold it to Lance Milbrand, a future Emmy nominated videographer, who eventually sold it to me. It was my first underwater system. I loved it and my friends all appreciated the tapes I made for them with no complaints. You placed the camcorder into the housing, sealed it up and you were ready to go. That was until the early 90's when Hi-8 was first introduced. The picture produced by the new Hi-8 camcorders was a significant improvement over standard 8 mm camcorders. The color resolution was deeper, more sharply detailed and was worth the extra price. I used my new Sony TR101 Hi-8 cam for a few years and learned my craft in terms of composition, shooting angles and linear editing. Hi-8 was state of the art for the average consumer until the first single and three chip digital camcorders hit the market. Now, here was a real break through with stunning clarity, great color resolution, low lux and a reasonable price. Sony came out with their DCR-1000 which was king of the hill for 3 chip digital camcorders for a few years before being replaced by the Sony 2000 and Canon XL cams, which is like an era in terms of today's ever growing and changing camcorder marketplace. Which brings us to today. With the advent of affordable High Definition Video camcorders, and housings for them being produced by Light & Motion, a whole new world of topside and underwater shooting is now available which enables us to create films with breathtaking resolution and with broadcast quality.

But why switch from the still very usable Standard Definition digital camcorders to High Definition? After all, Standard Definition still maintains a hold on the broadcast market, is easy to edit and can be effortlessly exported onto DVD without any down conversion of footage, figuring out which codec to use from a plethora of codecs and compression schemes, and is easily edited by most every non-linear editing software for PCs or Macs. All this is true and will remain so for, at least, a few more years. However, all videographers, underwater or not, aspire to the very best in clarity, color saturation and detail. Whether the

individual is just making a vacation video of his or her Cayman Island dive trip or aspiring to enter a local or national underwater film festival, we live in a competitive world and, currently, High Definition Video offers the very best in image quality with deeper color saturation, sharper detailing, and an image presence that is almost holographic.

Although definitions vary, the term HD itself primarily refers to a television screen offering of at least double the resolution of the highest quality standard definition TV screen which is, a screen resolution of 1920x1080i (interlaced), or 1280x720p (progressive scan), versus the current European PAL standard of 720x576 at 50 Hz picture refresh rate (or NTSC standard at the lower picture quality of 648 X 486 at 60 Hz picture rate). This provides the best available visual quality that current technology allows. DV NTSC is represented by a grid of 720x480 pixels at 29.97 frames per second for NTSC and 720x576 at 25fps for PAL. These are interlaces, so actually there are near 60 half frames per second for NTSC and 50 for PAL. We commonly denote DV NTSC as 480i or 480/60i to indicate the 480 pixels vertically (480 scan lines which actually carry visual information of NTSC's 525 total lines) and interlaced at 60 fields or half-frames per second. These digital specifications are used for Mini DV, Digital8, and DVD recording camcorders, as well as for DVD-video players of today.

All the above discussion concerns the 4:3 aspect ratio of "regular TV" which has been the standard for the last 50 years. The aspect ratio tells us how wide versus how high. These TV screen reflected 4 parts wide to 3 parts high, or 1.33 to 1. This has simply been referred to as 4:3 T.V. Widescreen denotes a screen that is wider, usually 16:9 or 2.35:1 Widescreen SD DV is implemented as 16:9 video in Mini DV, Digital8, and DVD recording camcorders. This is a bit of a trick. What is done is to simply use a wider pixel in the grid. For NTSC, there are still 720x480 pixels in a frame, but those 720 pixels across the screen are not "square" (not as high as wide) but very wide. Putting them side by side fills out to a 16x9 ratio of the width to the height. You see this in every day 'Widescreen' DVDs.

High Definition (HD) is the highest level of picture quality available, offering increased image resolution and detail. With more than twice the pixels (or lines) of resolution than Digital Video (DV) offers, Hi-Def must be screened on a HDTV (High Definition TV) for viewers to appreciate the difference in quality. High Definition Video (HDV) is shot at 1080 pixels, while Standard Definition uses 480 pixels. One reason why we enjoy movies at the theater is because the screen occupies a greater field of view, especially peripherally, making you feel like you are actually there and experiencing the action. Another way to compare the two is by looking at their pixel count (pixel is short for "picture elements", the individually addressable areas of light and shadow on your screen). The 720p format creates an image with 720 lines, each with 1280 pixels, so it has a

resolution of 1280 x 720. The 1080i format creates an image with 1080 lines, each with 1920 pixels, so its resolution is a higher 1920 x 1080. Denser pixels equals a better picture.

But I still have not answered the question, 'Why Switch to HDV?' HD (High Definition) is the new enhanced video standard. There have actually been, in fact, several formats, but the standard has, to this point, settled down to two: 1080i and 720p. Both of these are far superior in color and resolution (sharpness and detail) over SD. Almost all HD is in the 16:9 "widescreen" aspect ratio natively. The interlaced 1080i provides a grid of up to 1920x1080 pixels. Some implementations use 1440 "wide" pixels (1440x1080) which still looks far better than SD widescreen.

Currently Hi Def camcorders are priced as low as \$950.00 retail with street prices being found that are lower. The same can be said for Standard Definition Camcorders, their prices are just as low. If I were offered a Jaguar sports car for the same price as a Honda Civic, I am pretty sure that you would agree with me that the Jaguar would be the smarter choice.

Standard Definition camcorders shoot a 720x480 image. It is very usable in any 4x3 NTSC video sequence. A letterbox filter can be applied either in camcorder mode or in postproduction but the result will not be a true 16x9 sequence but a cropped down to size sequence. In addition, unless you were shooting with a 16x9 aspect ration, shooting a 4x3 clip and then cropping it to 16x9 would present several problems, the least of which would be your composition. For example, you have a good 4x3 clip of a whale shark, but once cropped to fit a 16x9 letterbox, you may find that the head of the whale shark has also been cut off so that the entire clip is rendered unusable in that format.

There are really too many pros to moving over to High Definition to count. The most important is also the most obvious; in terms of clarity, detail and color resolution, High Definition is a clear and decisive winner when compared to Standard Definition. The resolution puts the viewer into the picture with its 'you are there' image. It is seeing your underwater image for a second time as close to reality as current technology allows. Looking at the numbers with VHS having 240 pixels, and Standard Definition with 480 pixels, High Definition's 1080 pixels explain it all. The difference is resolute. The serrations of a sharks tooth will come into focus, the faces of divers will seem more expressive, there will be many more details to be found in the coral reef and the fish that you film.

HDV cams are capable of shooting both Standard Definition clips as well as true High Definition Video so that you will now get the best of both worlds. To be honest, I don't know anyone who uses his or her HDV cams to shoot Standard Definition but the option is there. In addition, you have no need to throw out your hard earned Standard Definition footage as standard definition can be incorporated into high definition video sequences with the use of third party plug-ins available for both PC and Mac non-linear editing programs.

The bottom line on why one should seriously consider moving over to a High Definition video camcorder and housing is because of the significantly increased quality of the picture. There truly is no real comparison between even a good 3 chip standard definition camcorder and a good one or three chip High Definition system. There are many good high definition camcorders on the market. I am partial to Sony Cams as they have always performed well, however, there are also very good cams produced by Panasonic, Canon and JVC. Sony has three new, one CMOS chip high definition cams, the HC-3, HC-5 and HC-7 in addition to their A1-U, FX-1, FX-7, Z1-U and HV-U. The FX cams, Z1 and HVU are a bit more expensive but produce wonderful quality images. The HC line of cams are very reasonably priced and, if used correctly, would challenge even the sharpest eye in a head to head comparison between them and the higher end camcorders.

Not all manufacturers make housings for every camcorder so it is important to check that a housing is or will be available before purchasing any camcorder for underwater use. Light and Motion make excellent housings for all but two of these camcorders. This allows you to purchase the High Definition camcorder of your choice without worrying whether you will be able to find a high quality housing to protective your high definition investment.

Time and technology will continue to go forward with only nostalgia turning our heads to look back. High Definition has taken the market by storm and, deservedly so, will be here for a long time to come. Jump in with both feet, cam and housing and you won't want to look back when you see your footage for the first time.

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